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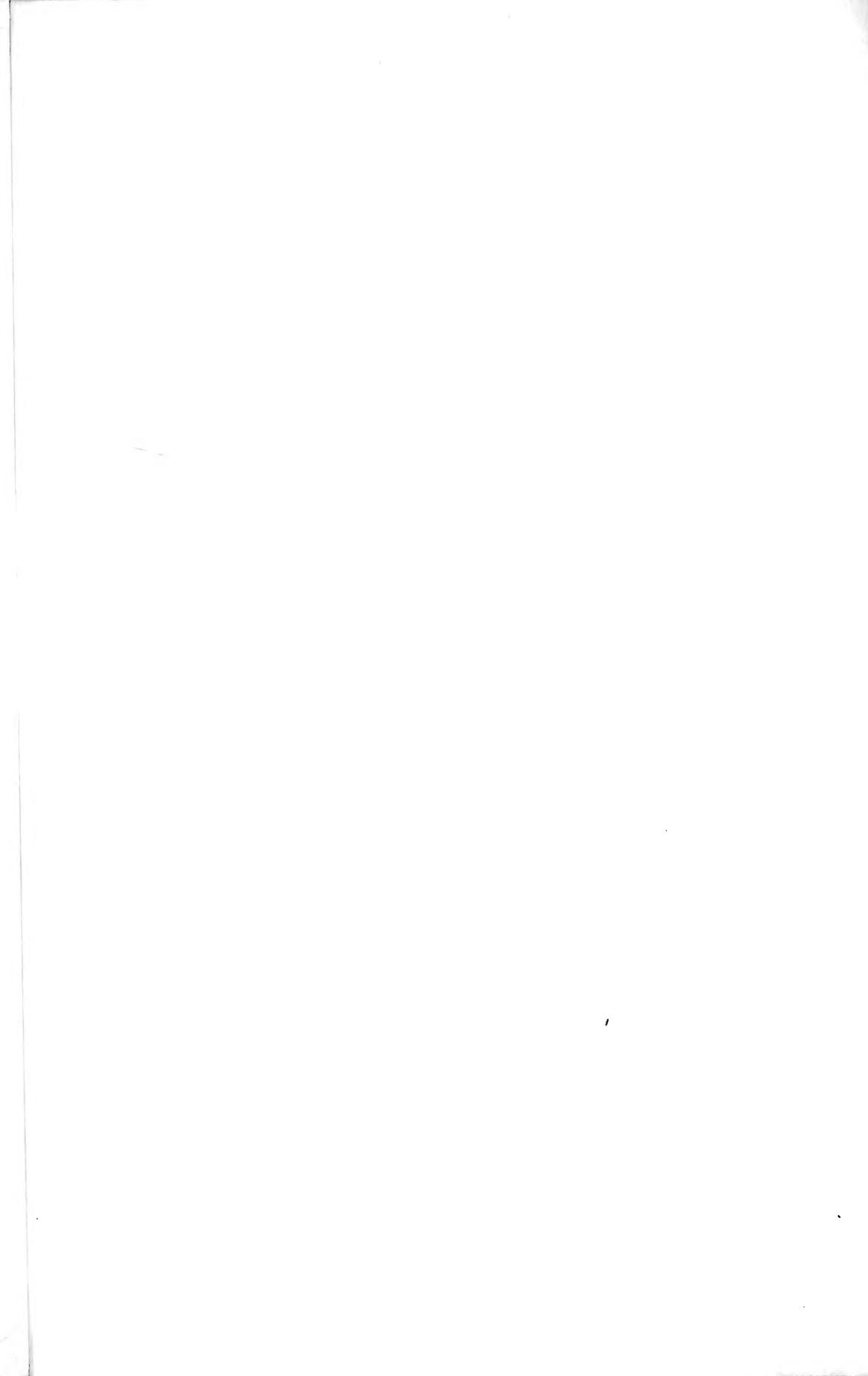
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The Mammals of the Huachuca Mountains, Southeastern Arizona

DONALD F. HOFFMEISTER and WOODROW W. GOODPASTER

ILLINOIS BIOLOGICAL MONOGRAPHS: *Volume XXIV, No. 1*

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MAMMALS OF THE HUACHUCA MOUNTAINS



The Mammals of the Huachuca Mountains, Southeastern Arizona

DONALD F. HOFFMEISTER and WOODROW W. GOODPASTER

ILLINOIS BIOLOGICAL MONOGRAPHS: *Volume* XXIV, No. 1

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Richard G. Van Gelder of the University of Illinois has been a most active participant in our field work in southeastern Arizona, and his endeavors and cooperation have gone far in making specimens and information available and in bringing this report to completion. Lois Goodpaster has aided in the preparation of the many specimens. Charles McLaughlin has prepared Figs. 13, 14, 15, 17, and 19. Mrs. Julius Swayne prepared Fig. 16.

The Arizona Game and Fish Commission, through A. N. Yoder, acting director, and Thomas Kimball, former director, kindly granted us permission to collect in the Huachucas. O. N. Arrington, chief, Arizona division of game management, has been most helpful. Stanley P. Young and Everett M. Mercer of the U. S. Fish and Wildlife Service furnished us with information about mammals in the Huachucas. C. C. Sanborn made specimens from the Huachucas in collections of the Chicago Natural History Museum available to us. Seth B. Benson, California Museum of Vertebrate Zoology, checked the identity of some of the *Perognathus* and *Sigmodon*. Emmet T. Hooper, University of Michigan, checked the identity of some of the specimens of *Reithrodontomys*. Thanks are extended to Philip Blossom for providing detailed information about his experiences with *Baiomys* in the Huachucas. Especial thanks go to the University of Illinois, which purchased some collections from the Huachuca Mountains and made possible our field activities there.

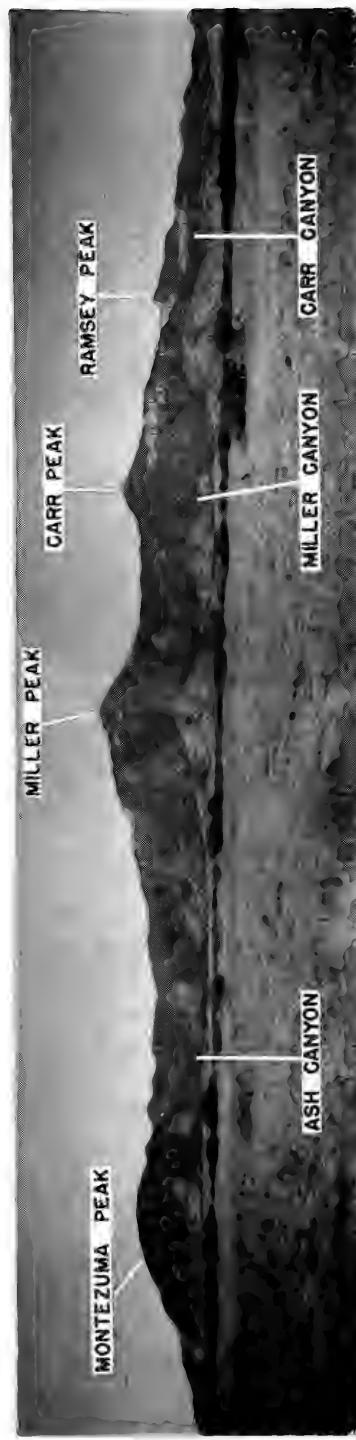
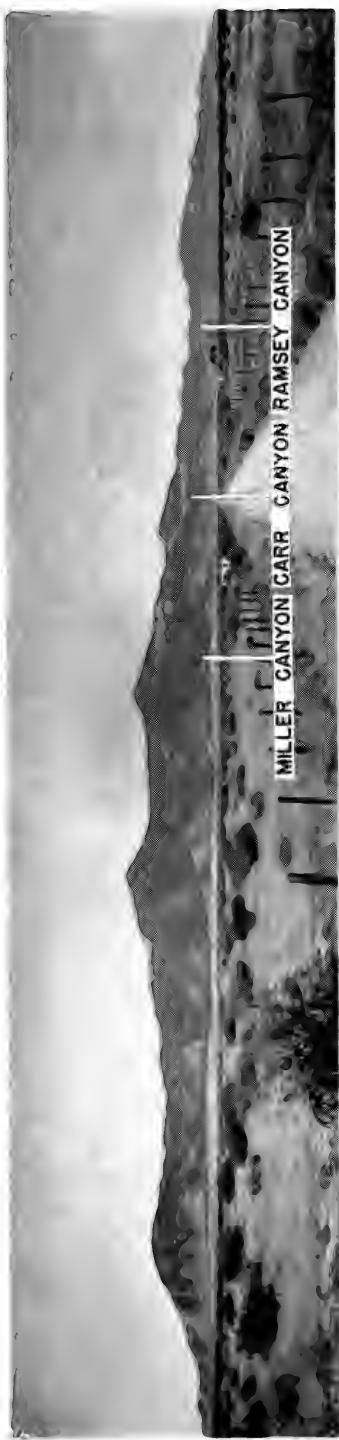


FIG. 1. Panoramic views of Huachuca Mountains, Arizona, as seen from the eastern side. Fort Huachuca is at the right-hand end of the mountains in the top picture; Sonora, Mexico, is to the left of Montezuma Peak. The alluvial fans at the mouths of the canyons and the apron or bajada connecting these fans are evident. Approximate elevation in foreground, 4500 feet; base of Mountains, 5000 feet; top of Miller Peak, 9445 feet. Photographed August, 1950, by W. W. Goodpastor.

Introduction

The presence in southeastern Arizona of high, cool mountain ranges rising above low, hot deserts has resulted in a great diversity of ecological niches, extreme altitudinal and zonal variation in a short distance, and in complete or nearly complete isolation. Such conditions in nature should be conducive to variation, differentiation, and speciation in animals or plants. One of the highest and most isolated of these ranges is that which straddles the Mexican Boundary near the 110th parallel—the Huachuca Mountains.

Studies of various groups of animals have shown that the Huachuca Mountains, although they comprise only about 100 square miles, are a haven for diversity of life. For example, of the species of birds breeding in North America, about one-quarter nest in the Huachucas, and at least 11 kinds of hummingbirds are found there. There are, in this limited area, some 536 kinds of plants, including 114 grasses. There are, in addition, more than 50 kinds of ferns. Insect life is just as diversified, and the Huachucas have been a collector's paradise for entomologists for many years.

There is little wonder that investigators were eager to learn if the mammalian fauna was as varied and interesting as the rest of the animals and plants in the Huachucas. Mammals had been studied there, in a somewhat cursory manner, during parts of 1892 and 1893 by E. A. Mearns and F. X. Holzner (Mearns, 1907), and in 1894 by W. W. Price, Loyer Miller, and B. C. Condit (Allen, 1895). To our knowledge, no studies of the mammals of the Huachucas, other than incidental observing or collecting, have been made since then.

Our own field activities have been spread over the following times: W. W. Goodpaster and L. W. Goodpaster, August 2 through August 27, 1949; August 1 through August 29, 1950; July 31 through August 3, 1951; and D. F. Hoffmeister and R. G. Van Gelder, August 9 through September 1, 1950; July 31 through August 3, 1951. Approximately 172 man-days were spent in the field observing and collecting. A total of 842 specimens of mammals was saved, mostly as conventional study skins with skulls; many pages of field observations and records of historical information from local residents were written; and numerous photographs were taken. Through our field work, we feel we have thoroughly surveyed the mammals in the Huachucas.

After the manuscript was completed, Hoffmeister revisited the Hua-

chucas for 7 days in December, 1952, to study and observe the mammals under winter conditions. Some of the records obtained then are also included.

Our expectations of diversity of mammals in the Huachucas were not unwarranted. The total of 78 kinds of Recent mammals found there is more than 40 per cent greater than the total kinds of mammals occurring in the entire state of Illinois, yet the area is only one five-hundredth of that of Illinois. Even more interesting are the complex interrelationships of allied species found in this small area. For example, 3 species of harvest mice, 3 species of kangaroo rats, or 3 species of pocket mice may be found in an area of not more than an acre. Four kinds of skunks can be taken together. Not only are there many interesting problems in speciation and niche relations, but also in subspeciation, for many species of mammals reach the limits of their range in the Huachucas, and the variation in terminal populations is worthy of careful analysis.

Methods

The Huachuca Mountains are here regarded as including the mountain range proper, from Fort Huachuca southeastward to the International Boundary, and including the alluvial fans at the mouths of the canyons and the bajada connecting the alluvial fans (see Figs. 1, 16). No collecting was done in the limited, southern portion of the Mountains that extend into Mexico. All specimens listed from the Huachuca Mountains are from Cochise County.

In the accounts of the species, capitalized color terms are from Ridgway (1912). The superior numbers in the *Measurements* correspond to the same numbers in the *Records of occurrences* and indicate that a particular specimen measured from number 3, for example, is from the locality with a superior number 3. In the section on *Comparisons*, critical comments are usually given as to how the specimens in the Huachucas resemble or differ from nearby named forms and why they are referred to one rather than another named form, and frequently a description of the material is included. Under *Remarks*, pertinent information on the life history and ecology of the species in the Huachucas is included. In this section, we have also attempted to portray some of the interrelationships of the species.

All specimens, unless otherwise indicated, are in the University of Illinois Museum of Natural History.

All measurements are given in millimeters or tenths of millimeters.

History

Early in the nineteenth century, a few Spanish haciendas had been established at and near the base of the Huachuca Mountains. Tens of thousands of cattle were raised by the rancheros, and in the early 1800's cattle had, in all likelihood, ranged in the Huachuca Mountains.

Southeastern Arizona was obtained by the United States from Mexico in the Gadsden Purchase of 1853. The presence of warlike Apache Indians and the influx of settlers and miners with the discovery of important ore-producing minerals at nearby Tombstone and Charleston brought about the establishment of an army post and fort in the Huachucas. In 1877, an army camp was established at the north end of the Huachuca Mountains. This camp became a permanent fort in 1881. Fort Huachuca, and the inclusive military reservation, consisted of some 76,000 acres by 1945. This military establishment trained army personnel through World War II, but in 1949, 35,000 acres of the military reservation were transferred to the Arizona Game and Fish Commission and a lesser amount to the National Guard. The parts of the Mountains not in the military reservation are within the Coronado National Forest.

The Huachuca Mountains possess a relatively large amount of various ores. Mining, usually on a small scale, has been going on in these Mountains since the turn of the century. The opportunity of securing vast amounts of important minerals in the Huachucas has attracted prospectors and miners to the Mountains. The opening of mine shafts and prospect holes has supplemented the few natural caves and has provided additional habitat for certain kinds of mammals.

The "natural" aspects of the range on and around the Huachucas have probably been continuously altered through the grazing of cattle, the picketing of horses, the occasional burning of the lower slopes, and the presence of thousands of men with mechanized equipment. As many as 40,000 cattle from a single ranch have grazed in and around the Huachucas. According to Darrow (1944:313), the heavy concentration of cattle reached a peak in 1891 when a severe drought accentuated the depletion of range forage. From then on, there was a tendency to establish an equilibrium between forage resources and livestock. Not until 1930 were the 76,000 acres of the Fort area completely fenced to keep cattle out. However, cattle only infrequently ranged high into the Huachucas, and the fencing of the Fort area provided a refuge and sanctuary for some kinds of wild mammals. At the present time, cattle usually

are not permitted in the national forest, although under certain conditions permission is granted. Reportedly, landowners frequently burn off parts of the lower slopes with the intent of increasing grass production for livestock. A result of prolonged heavy grazing on the bajada and alluvial fans near the base of the Mountains has been the increase in mesquites and cacti and a reduction in seed-producing perennial grasses.

The removal of large quantities of water from some canyons, such as the removal of water from part way up Miller Canyon for piping to Tombstone, some 20 miles away, has affected the floral aspect of the lower parts of the canyons and the alluvial aprons. Creek beds which, under present conditions, are dry for long periods of the year as the result of the removal of water may provide new habitat for rock squirrels and other kinds of mammals.

Since large pines and firs are not abundant in the Huachucas, and good roads to the limited stands of larger trees are not available, lumbering on a large scale has not been undertaken in recent years, although many years ago some wood was taken to Tombstone. Removal of timber has been principally by fires and not directly through the activities of man.

Physiography

The Huachucas are one of the highest ranges of mountains extending across the International Boundary between the Gulf of Mexico and the Pacific Ocean. The range is a small one, being about 25 miles long and 4 miles wide, and extending northwest and southeast, mostly into the southeastern corner of Arizona (Cochise County) and partly into Sonora, Mexico (see Fig. 16). The range is composed of a single ridge which is highest near the center, and here two peaks attain an altitude of nearly 9500 feet (Miller Peak, 9445; Carr Peak, 9214). The base of the Mountains along the east is at about 5000 feet and along the west at about 5700 feet. Several well-watered canyons (Garden and Miller canyons, especially) extend down the east side. The canyons open out onto broad alluvial fans, and the alluvial fans of the many canyons are interconnected, forming a bajada or broad apron of detritus. The alluvial fans slope rather gradually out onto the desert plain—toward the San Pedro River to the east and south, the Santa Cruz River to the west, and the Babocomari River to the north.

The Mountains proper are well wooded. The higher parts are covered with conifers and a few aspen; the lower parts with broad-leaved trees and chaparral; the alluvial fans with grasses and mesquite.

Climate as It Affects the Mammals

The climate in the Huachucas can best be described as moderate for southwestern United States. The average January temperature at Fort Huachuca is 46° F., and the average July temperature is 77° F. The average rainfall is 17.0 inches with over half of this precipitation in July, August, and September. Many of the plants flower and seed during these months, providing food for immediate use and for storage by mammals. Snow falls in the Huachucas any time from December to March, and the higher regions are covered with one foot or more of snow for several months during some winters. Along the crest, snow may lie to a depth of nearly 8 feet. On sheltered sides of higher peaks, this snow may remain until mid-May or early June. At Fort Huachuca, 5100 feet elevation, the average annual snowfall is 7.7 inches. The average late frost is March 30, and the average early frost is November 17. Although the temperature may be below freezing for a considerable part of the winter, some small mammals which may hibernate at other places apparently do not do so in the Huachucas. This seems to be true for some of the kangaroo rats, pocket mice, and rock squirrels. It may even be true for some of the bats. In an average year there are 241 days of clear sky, 74 partly cloudy days, and 50 cloudy days. Cloudbursts of short duration occur in the summer and are extremely local, in that only one side of the Mountains or only one end of the Mountains may get rain. This variation in precipitation within the mountain range may have considerable influence on the mammals throughout the year. It may cause larger mammals to move into canyons that are more lush; and sedentary mammals may become more active in a canyon that has received a rain, making the ground more workable or causing new plant growth.

Evaporation is about 80 inches per year according to Wallmo (1951:2). The ratio between precipitation and evaporation is most important in limiting vegetational types in the Mountains, according to Wallmo. Another limiting factor, he points out, is the variation in rainfall from year to year: 9.12 inches in 1947 versus 22.27 inches in 1949. When there is as much as 20 inches of precipitation in one year, most streams and springs flow throughout the year. In periods of drought, such as in 1947 and 1951, most streams dry up; and on occasions of extreme drought, even the San Pedro River dries up. Eight springs near Fort Huachuca which were metered produced 59,000,000 gallons of water in March, 1949. In a drier year (1950), these springs produced only 5,000,000 gallons in

March. Mearns (1907:102) was greatly impressed by the spring-fed streams of cold water in the Huachucas, and he commented that the streams were "the best that we found [along the International Boundary] between the Coast Range and the Rio Grande." These periodic fluctuations in stream conditions must constantly add and also remove certain suitable habitats for some kinds of mammals.

WEATHER RECORDS AT FORT HUACHUCA
elevation 5100 feet

	Temperature (32-year record)	Degrees (F.)
January average	.....	46.2
July average	.....	76.6
Maximum; and average maximum for Jan., Apr., July, Oct.	105; 59.1, 74.8, 89.6, 77.2	
Minimum; and average minimum for Jan., Apr., July, Oct.	0; 33.3, 45.5, 63.7, 49.4	
Annual average	.....	61.4

Killing Frost (20-year record)

Last in spring (average)	.....	March 30
First in fall (average)	.....	November 14
Growing season (days)	.....	229

Average Precipitation (33-year record^a)

	Inches
January	1.32
February	1.19
March	.95
April	.28
May	.30
June	.52
July	3.81
August	4.02
September	1.82
October	.69
November	.94
December	1.12
Annual	16.96

Average Snowfall (18-year record)

	Inches
January	1.8
February	3.0
March	.5
April	T
November	T
December	2.4
Annual	7.7

^a 1886-1918.

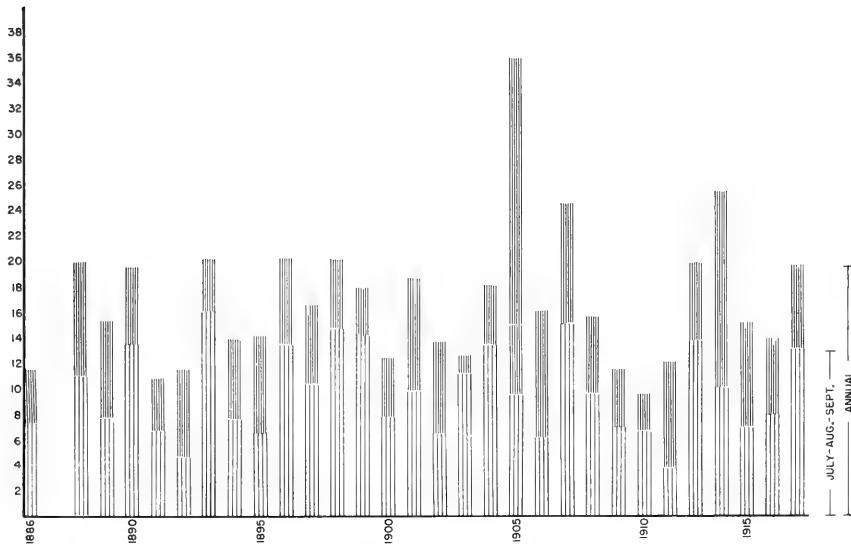


FIG. 2. Annual precipitation in inches at Fort Huachuca, 5100 feet, north end of Mountains, from 1886 to 1917. Vertical lines represent total precipitation; widely spaced lines represent that portion of precipitation during wettest part of year (July through September). Data from U.S.D.A., climatic summary, sec. 26, for southern Arizona.

Life-Zones, Plant Belts, and Associated Mammals

Plant belts have been defined or delimited by Wallmo (MS) for the Huachuca Mountains, and we have followed, in considerable measure, his arrangement. The most characteristic mammals found in each belt are listed on the following pages, and it is indicated whether the species are restricted, or nearly restricted, to that belt.

Life-zones as well as plant belts can be recognized and delimited in the Huachucas. By placing the mammals in various life-zones, it may be possible to compare the mammals of one zone in the Huachucas more easily with those of the same zone some distance removed. This similarity of life in broad belts, in altitudinal and latitudinal sequence, has been appreciated for a long time. With a system of life-zones, it should be possible to recognize a similarity of kinds of mammals within one zone even in areas far removed. However, some investigators point out that below the Transition Life-zone such similarities of groups of animals between eastern and western United States do not exist within a single zone. We would think that such similarities should not be expected because of the marked differences, particularly in the summer, in rainfall and humidity between eastern and western regions of the United States. Thus, it seems wise to abandon any concept of broad transcontinental life belts below the Transition. These belts across the nation have sometimes been called Lower Austral and Upper Austral life-zones (Merriam, 1898). Instead, the eastern, humid divisions should be called Austro-riparian and Carolinian; the western divisions, Lower Sonoran and Upper Sonoran. For extent of these zones, reference can be made to the stippled and unstippled portions of Merriam's life-zone map (1898). With such a concept, mammals of life-zones in Alabama would not be compared with mammals of lower zones in Arizona, although mammals of the Transition Life-zone, or of higher zones, in Arizona could be compared with mammals of the Transition Life-zone, or of higher zones, in eastern United States where comparable zones exist.

Lower Sonoran Life-Zone

This zone is regarded as consisting of the following plant belts:

Desert Scrub
Desert Grassland

Some characteristic species of mammals¹ are:

Dipodomys ordii *	Thomomys bottae hueyi *
Dipodomys spectabilis *	Sigmodon hispidus *
Dipodomys merriami *	Notiosorex crawfordi *
Perognathus hispidus *	Lepus californicus *
Perognathus flavus *	Sigmodon minimus
Perognathus penicillatus *	Reithrodontomys fulvescens
Peromyscus maniculatus sonoriensis *	Reithrodontomys montanus
Onychomys torridus *	Reithrodontomys megalotis
Onychomys leucogaster *	Baiomys taylori
Citellus spilosoma *	Odocoileus hemionus

*Desert Scrub Belt:*² This vegetational type occurs chiefly below the area here delimited as the Huachuca Mountains. The upper limit of this belt is about 4500 feet. The dominant plant is white-thorn (*Acacia constricta*), together with some creosote bush (*Larrea tridentata*) and various gramas (*Bouteloua*).

Some characteristic mammals are:

Cynomys ludovicianus	Odocoileus hemionus
Vulpes macrotis	Lepus alleni (not in Mountains, but adjacent thereto)
Canis latrans	

Desert Grassland Belt: An open prairie-like grassland occurs on the alluvial fans. This is principally between 4500 and 5000 feet elevation. The grama grasses are the predominant forms. At the upper edge of the alluvial fans, curly-mesquite (*Hilaria belangeri*) and plains lovegrass (*Eragrostis intermedia*) become the predominant forms on many of the broad ridges.

Some characteristic mammals are:

Perognathus flavus *	Reithrodontomys megalotis
Perognathus penicillatus	Thomomys bottae hueyi *
Perognathus hispidus	Citellus spilosoma
Dipodomys spectabilis *	Citellus variegatus
Dipodomys ordii *	Baiomys taylori *
Dipodomys merriami *	Notiosorex crawfordi *
Onychomys torridus *	Canis latrans
Onychomys leucogaster	Lepus californicus
Sigmodon hispidus *	Peromyscus maniculatus sonoriensis
Sigmodon minimus	Peromyscus eremicus
Reithrodontomys fulvescens	
Reithrodontomys montanus	

¹ Species of mammals marked with an asterisk are more common in this zone (or belt) and may be regarded as most closely restricted to it.

² For a complete characterization of each belt, see Wallmo, MS.

In places the desert grassland has been invaded by mesquite (*Prosopis velutina*), and blue and black gramas (*Bouteloua gracilis* and *B. eriopoda*) often dominate. Most characteristic of this mesquite-grassland are the 3 species of *Dipodomys* and *Onychomys leucogaster*. This mesquite-grassland is sometimes referred to as the "Dipodomys-zone."

Upper Sonoran Life-Zone

This zone is regarded as consisting of the following plant belts:

Oak Woodland
Woodland Chaparral
Chaparral-Conifer

Some characteristic mammals are:

<i>Peromyscus boylii</i> *	<i>Nasua narica</i> *
<i>Sylvilagus audubonii</i> *	<i>Sciurus arizonensis</i> T ³
<i>Odocoileus virginianus</i> *	<i>Neotoma albigula</i> LS
<i>Spilogale putorius</i> *	<i>Sigmodon ochrognathus</i>
<i>Mephitis mephitis</i> *	<i>Perognathus intermedius</i>
<i>Conepatus mesoleucus</i> *	

Oak Woodland Belt: On most of the wooded and brushy slopes, oaks predominate. These oaks may assume a true woodland character, and the woodland may be open and savanna-like. The principal oaks are Emory (*Quercus emoryi*) and Arizona white oak (*Q. arizonica*). In canyon bottoms the most characteristic trees are Arizona sycamore (*Platanus wrightii*), with some cottonwoods (*Populus fremontii*), willows (*Salix*), maples (*Acer*), walnut (*Juglans major*), and wild grape (*Vitis arizonica*).

Some characteristic mammals are:

<i>Peromyscus boylii</i> *	<i>Sciurus arizonensis</i>
<i>Neotoma albigula</i> *	<i>Spilogale putorius</i> *
<i>Odocoileus virginianus</i> *	<i>Mephitis mephitis</i>
<i>Sigmodon ochrognathus</i>	

Woodland Chaparral Belt: Oaks or junipers may occur as a scrub or brush under xeric conditions. Manzanita (*Arctostaphylos pungens*) forms a dense impenetrable chaparral on some exposed ridges in this belt. Hairy mountain-mahogany (*Cercocarpus breviflora*) occurs most abundantly in this belt.

³ "T" indicates that the species occurs in parts of the Transition zone and may be fairly abundant there. "LS" indicates the same for the Lower Sonoran zone.

Some characteristic mammals are:

<i>Sylvilagus audubonii</i>	<i>Perognathus intermedius</i>
<i>Citellus variegatus</i>	<i>Nasua narica</i>
<i>Peromyscus boylii</i>	

Chaparral-Conifer Belt: Certain stands of oak chaparral contain some pines or Douglas firs (*Pseudotsuga taxifolia*). The conifers may be young trees or fire-scarred old trees.

This plant belt has not been intensively investigated, but it is believed that mammals are not abundant and some species found in it include:

<i>Peromyscus boylii</i>	<i>Reithrodontomys megalotis</i>
<i>Conepatus mesoleucus</i>	

Transition Life-Zone

This zone is regarded as consisting of two plant belts:

<i>Pine-Douglas Fir-Oak</i>
<i>Pine-Fir Forest</i>

Some characteristic mammals are:

<i>Neotoma mexicana</i> *	<i>Sciurus arizonensis</i>
<i>Sorex vagrans</i> *	<i>Peromyscus maniculatus rufinus</i>
<i>Sylvilagus floridanus</i> *	
<i>Thomomys bottae intermedius</i> *	

Pine-Douglas Fir-Oak Belt: A forest of pines, Douglas fir, and oaks occurs in sheltered canyons and on north-facing slopes. Snow may remain on the ground in this belt for 3 or 4 months.

Some characteristic mammals include:

<i>Sylvilagus floridanus</i>	<i>Sorex vagrans</i>
<i>Sciurus arizonensis</i>	

Pine-Fir Forest Belt: White fir (*Abies concolor*), Douglas fir, several kinds of pines, and a few aspens (*Populus tremuloides*) occur on the cool north and northeast slopes of the higher peaks as Miller, Carr, Ramsey, and Huachuca.

Some characteristic mammals include:

<i>Thomomys bottae intermedius</i>	<i>Sylvilagus floridanus</i>
<i>Neotoma mexicana</i>	<i>Peromyscus maniculatus rufinus</i>
<i>Reithrodontomys megalotis</i>	<i>Peromyscus boylii</i>

Canadian Life-Zone

This life-zone consists of a single belt in the Huachuca Mountains:

Aspen

Aspen Belt: Almost pure stands of aspen occur on the north face of Carr Peak above 8400 feet and perhaps on Miller Peak.

Some mammals are:

Neotoma mexicana
Sylvilagus floridanus

Peromyscus boylii



FIG. 3. Miller Canyon, showing the alluvial fan with the upper portion of the desert grassland, the oak woodland belt, and higher belts. Miller Peak is to the left, Carr Peak to the right. The "head of Miller Canyon" (Fig. 4) is near the saddle between the two peaks. Photographed August, 1950, by W. W. Goodpaster.

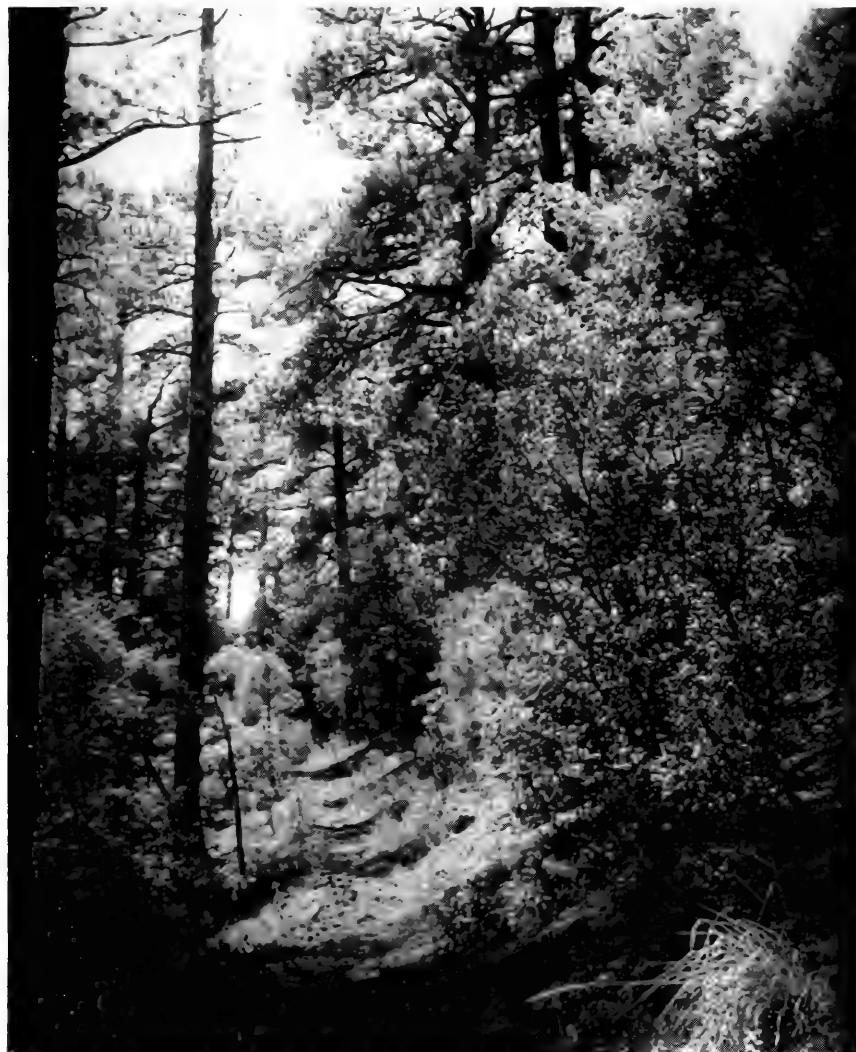


FIG. 4. Near head of Miller Canyon, in the pine-Douglas fir-oak belt, about 8000 feet. Plants found here include Arizona and Mexican white pine, Douglas fir, silver leaf, netleaf, and Gambel oaks, madrone, and bull grass. The Arizona gray squirrel and possibly the eastern cottontail occur here. Photographed August, 1950, by R. G. Van Gelder.



FIG. 5. Mouth of Carr Canyon below the oak belt and above the *Dipodomys*-zone. Here on the alluvial fan occur 3 species of *Perognathus*, 2 species of *Citellus*, *Notiosorex*, *Onychomys torridus*, *Thomomys bottae hueyi*, *Neotoma albigenula*, and *Peromyscus eremicus* (1 specimen only). Photographed August, 1950, by W. W. Goodpaster.



FIG. 6. Carr Canyon above the mouth and alluvial fan (Fig. 5), from the oak belt to the crest. Healy's Ranch is in the center foreground; the Reef is the mass of rocks to the left of the center; Seeman's is located near the center of the picture and on top of the Reef. The spot denuded of trees near the crest and to the left of center is near the "meadow" on Carr Peak where *Thomomys bottae intermedius* was taken (Fig. 24). Photographed August, 1950, by W. W. Goodpaster.



FIG. 7. Ramsey Canyon, showing the grassland at the mouth of the canyon merging with the oak belt. In the left foreground near the buildings *Notiosorex crawfordi* was taken. Photographed August, 1950, by W. W. Goodpaster.



FIG. 8. Southern end of Huachuca Mountains, extending south from Montezuma Canyon (Montezuma Canyon Road visible) into Sonora, Mexico. Photographed August, 1950, by W. W. Goodpaster.



FIG. 9. West side of Huachuca Mountains, with Lone Mountain in the center, and high plains of west side (about 5800 feet) in foreground. *Lepus californicus* was numerous here, and a hare thought to be *Lepus gailliardi* was seen near here. Photographed August, 1950, by R. G. Van Gelder.



FIG. 10. Peterson's Ranch or Sylvania, west side of Huachuca Mountains, with recently constructed pond. Habitat of *Reithrodontomys megalotis*, *Lasiurus cinereus*, *Eptesicus fuscus*, *Peromyscus boylii*, *Neotoma albigenula*, and type locality of *Sigmodon ochrognathus montanus*. Photographed August, 1950, by R. G. Van Gelder.



FIG. 11. Oak woodland at northwest end of Huachuca Mountains near Canelo Gate. Photographed September, 1950, by R. G. Van Gelder.



FIG. 12. Winter snow on east slope of Huachuca Mountains. Along the crest, snow may become 8 feet deep. At 5100 feet elevation (at Fort Huachuca), the average snowfall is 7.7 inches. Photographed by W. F. Heald.

Interrelationships of Species

Within small areas, an acre or less in the Huachucas, several species of the same genus, and closely related genera of the same group, may occur "together." For example, within a limited trapping area, 3 species

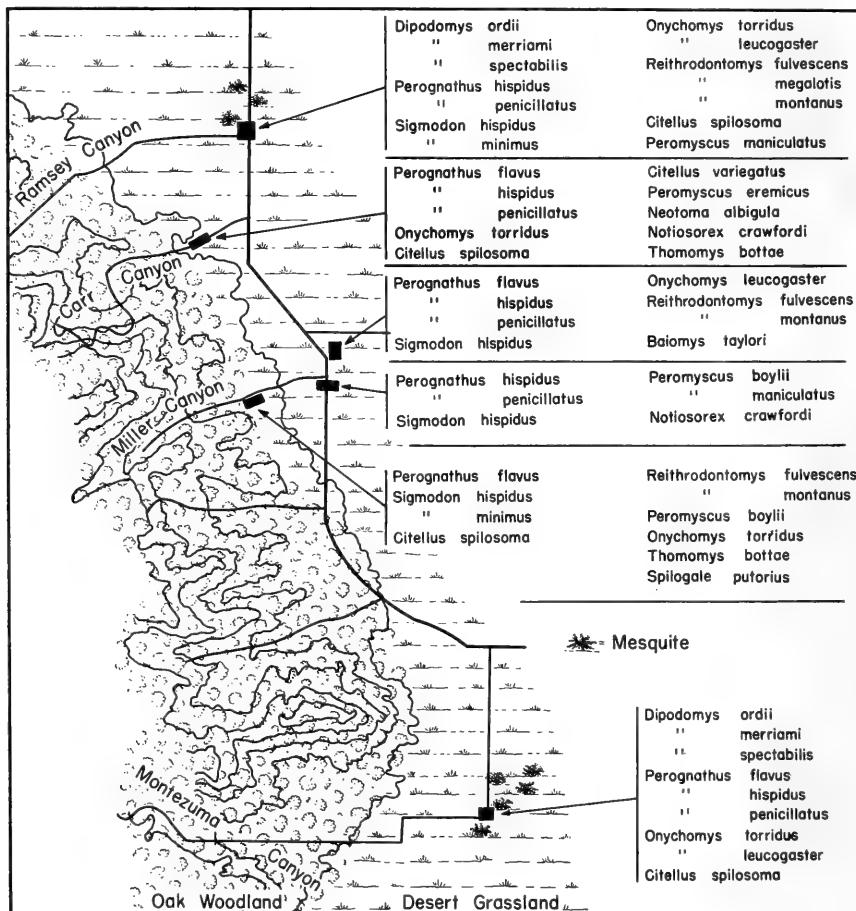


FIG. 13. Several species of the same genus frequently occur together at the same trapping sites (black rectangles), although each area is scarcely larger than an acre. This is shown in the above lists of small mammals collected on the grassy alluvial fans of certain canyons along the eastern base of the Huachucas. Note how some species occur where mesquite invades the desert grassland and how other species drop out near the edge of the oak woodland. Not drawn to scale.

of kangaroo rats (*Dipodomys*), 3 species of pocket mice (*Perognathus*), 3 species of harvest mice (*Reithrodontomys*), 2 species of cotton rats (*Sigmodon*), 2 species of grasshopper mice (*Onychomys*), or 4 species of skunks (of 3 genera) may be taken. Probably nowhere else in the United States do more species so closely related occur so close together, seemingly in the same ecological niche. Figure 13 shows the species of small mammals taken in our trapping areas on the grassy alluvial fans of certain canyons along the eastern base of the Mountains. As one progresses up the alluvial fans and approaches the oak woodland or woodland chaparral, some species, common at lower elevations, drop out; and others enter for the first time or become more abundant.

Of the kangaroo rats, *Dipodomys ordii* and *D. merriami* seemingly occupied very nearly the same niches. The two were taken together at 4 localities, and undoubtedly would have been taken together at a fifth locality (10 mi. SE Fort) if more collecting had been done there. Only at one locality did the two probably not occur together. Since it was possible readily to distinguish between *D. ordii* and *D. merriami* in the field, we endeavored to discern any ecological segregation whenever these kangaroo rats were collected but could find none. *Dipodomys spectabilis* was found in 3 places we trapped, and at these 3 places, *D. ordii* and *D. merriami* were present. However, in contrast to the other 2 species, *D. spectabilis* did not occur as far up the alluvial fan and was found where the grasses were less dense and the mesquite less abundant.

Of the harvest mice, 3 species (*Reithrodontomys megalotis*, *montanus*, and *fulvescens*) were found together only at one place (mouth of Ramsey Canyon), but continued collecting at the mouths of other canyons might indicate that all three occurred there also. In Ramsey Canyon, the 3 species occurred in the thick, dry grasses along or near a fence and between the fence and road. In this area, the grass was ungrazed. No differences in ecological niches were noted for any of the three. Near the lower edge of the alluvial fan, in Miller Canyon, only *R. fulvescens* and

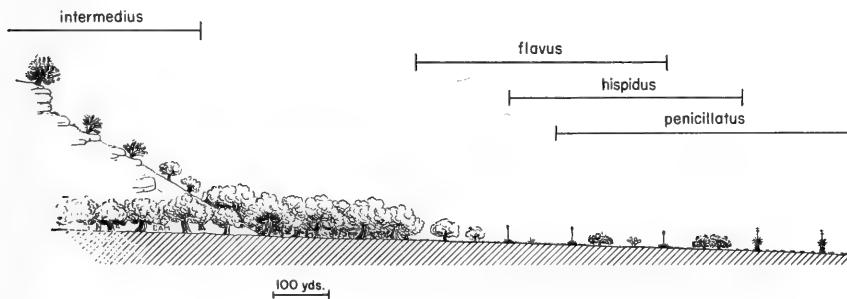


FIG. 14. Diagrammatic cross-section of alluvial fan and base of Huachuca Mountains to show general zonal distribution of the four species of pocket mice, *Perognathus*.

R. montanus were present (*R. megalotis* was absent). Again, at the upper edge of this alluvial fan, at the edge of the oak belt, the same 2 species were taken.

The 4 species of pocket mice occur in a zonal fashion as indicated in Fig. 14. On the alluvial fan, usually 3 species (*P. flavus*, *hispidus*, and *penicillatus*) are found together. Near the fan's upper edge, only *P. flavus* is present. *P. penicillatus* occurs where the grass is less abundant and there are mesquites, yuccas, and prickly pears. *P. hispidus* occurs where the grasses and weeds are more dense and there are fewer mesquites, yuccas, and agaves. *P. flavus* occurs farthest up the alluvial fan, in dense stands of grama, and up to where the grasses interdigitate with the oaks. There is a fairly wide intermediate zone, on the alluvial fan, where all 3 species occur together, and the different species can be taken in traps within a few feet of one another. The fourth species, *P. intermedius*, occurs on the rocky soil of ledges and rocky slopes where there is little grass and some mountain mahogany, sumac, and scrub oak. *P. intermedius* did not occur with any of the other species of *Perognathus*.

Of the 2 species of *Sigmodon* that occurred on the alluvial fan, both seem to occupy the same ecological niche. The 2 species of *Onychomys* occupied niches that must be quite similar, although *O. torridus* occurs farther up the fan.

All 4 kinds¹ of North American skunks are to be found in a limited area in the mouth of Miller Canyon. At the lower edge of the oaks, the spotted skunk is abundant; throughout the wooded portion of the hills the hog-nosed skunk is present; in the oak belt, the striped skunk is present; our one hooded skunk came from below the tree zone, out on the alluvial fan. Of the 4 species of cats in the Mountains, only 2 are probably resident—bobcat and mountain lion. The bobcat occurs from the desert floor to the mountain peaks; the mountain lion restricts itself almost entirely to the rimrock, of which there is ample in the Mountains. The 4 species of canids inhabit the lower slopes and alluvial fans: the coyote hunts principally below the oak belt, the timber wolf along the foothills, the gray fox in the oak belt, and the kit fox, when present in former years, far out on the alluvial fans.

The ecological distribution of the 6 kinds of *Peromyscus* is not too clear because 4 of them are poorly represented in the Huachucas. *Peromyscus maniculatus sonoriensis* occurs, in limited numbers, on the alluvial fans, near the edge of the tree zone. In the wooded portion of the Mountains, the most abundant mouse is *P. boylii*. It occurs from the oak through the aspen belt, but is most abundant in the oak belt. *P. maniculatus rufinus* occurs, in limited numbers, in the fir and aspen belt, near the crest of the Mountains. *P. eremicus* probably occurs mostly below the alluvial

¹ The 4 kinds referred to are: spotted, striped, hooded, and hog-nosed skunks.

fans, but at least two individuals were present well up on the fan, as indicated by the specimens taken in Carr Canyon. *P. leucopus* supposedly occurs only at the lower elevations along river bottoms, usually in sacaton (*Sporobolus wrightii*), but at least one, taken by us, occurred in the creek bed among horsetail (*Equisetum hyemale*) and deep leaf-mold, at an elevation of about 6100 feet.

At the lower edge of the alluvial fan, as at Montezuma and Ramsey canyons, *Dipodomys spectabilis*, *ordii*, and *merriami* and *Onychomys leucogaster* are present but are at the upper limits of occurrence and about to drop out. Half-way up the alluvial fan, *Perognathus hispidus* and *penicillatus* and *Peromyscus maniculatus sonoriensis* are at the upper limits of occurrence and about to drop out, whereas, in our experience, *Perognathus flavus* is relatively more abundant here. Of all the species of small mammals listed in Fig. 13, only the following commonly extend above the alluvial fans into the oak belt or above: *Peromyscus boylii*, *Reithrodontomys megalotis*, *Spilogale putorius*, and *Citellus variegatus*.

The large number of species (78) of mammals found in such a small area as the Huachucas is correlated with several apparent factors, and probably there are many others which are not evident to us. Some of these factors are:

(1) *Diversity of ecological niches.* Within a short distance, as from the foot of the Mountains to the crest, there are distinctive belts or areas of desert scrub, desert grassland, oak woodland, woodland chaparral, pine, fir, and aspen. There are natural caves and numerous deep mine tunnels (especially suited for bats); rimrock and rocky slopes; cool canyons, some of which have a flow of water throughout the year; and extremes of precipitation by rainfall and snowfall.

(2) *Geographical position of the Mountains.* Since the Huachucas are not too far removed from the Mogollon Plateau to the north, the lower portions of the Rocky Mountains to the east, the Sierra Madre of Mexico to the southeast, and the Lower Sonoran deserts to the west, some kinds of mammals from each of these have been able to reach the Huachucas.

(3) *General isolation of Mountains now, but apparent lack of isolation during part of Pliocene and Pleistocene.* Many species of mammals occurring in the oak-woodland, or above, are isolated now from species in similar habitats in nearby mountains by the intervening deserts. Evidently, during some parts of the Pliocene and Pleistocene, the conditions of the "deserts" were such that they did not provide an effective barrier to the interspersion of these same species.

(4) *Proximity to Mexico.* At least one species, the wolf, maintains itself in the Huachucas, despite predatory control measures, by a continuous emigration from Mexico where control measures are not as extensive.

Geographical Affinities of the Mammalian Fauna

Of the species of mammals making up the fauna of the Huachucas, 13 are southern, that is, they occur exclusively or nearly exclusively to the south of the Huachucas except for those individuals which extend as far north as these Mountains. By the same criterion, 5 species are eastern and 4 species are northern. These northern, eastern, and southern species which reach the Huachucas are shown in the center of the graph (Fig. 15). The remaining species of the Huachucas occur both to the north and south or east and west of the Mountains, and extend across and beyond the Mountains and do not reach the limits of their distribution here. The fauna in the Huachuca Mountains has the following composition:

<i>Per Cent</i>	<i>Species</i>
19	southern
7	eastern
6	northern
0	western
68	cosmopolitan

Reference to Fig. 15 indicates that those species of southern mammals which come near to the Huachuca Mountains usually reach the Mountains. For example, there are only 2 species of southern mammals that come within 100 miles of the Huachucas yet do not quite reach the Huachucas. There are only 5 species that come within 200 miles and yet do not quite reach the Huachucas. To the north, the situation differs, for it is apparent that many northern species come near to the Huachucas but never enter them. Within 100 miles to the north, 7 species occur that do not enter the Huachucas and within 200 miles there are 17 species that do not enter. The Huachuca Mountains must be regarded as providing a northern "island" or limit for many southern species, and much less importantly as a western or southern limit for eastern and northern species, respectively. Many northern and boreal species extend southward to the White Mountains, or even to the Graham or Chiricahua mountains, but not quite into the Huachucas. This is particularly true for some of the shrews, sciurids, and microtines. It is probable that the amount of boreal habitat in the Huachucas is not great enough to support some of these northern species. However, it is difficult to explain readily why such species as the chickaree, *Tamiasciurus fremonti*, and

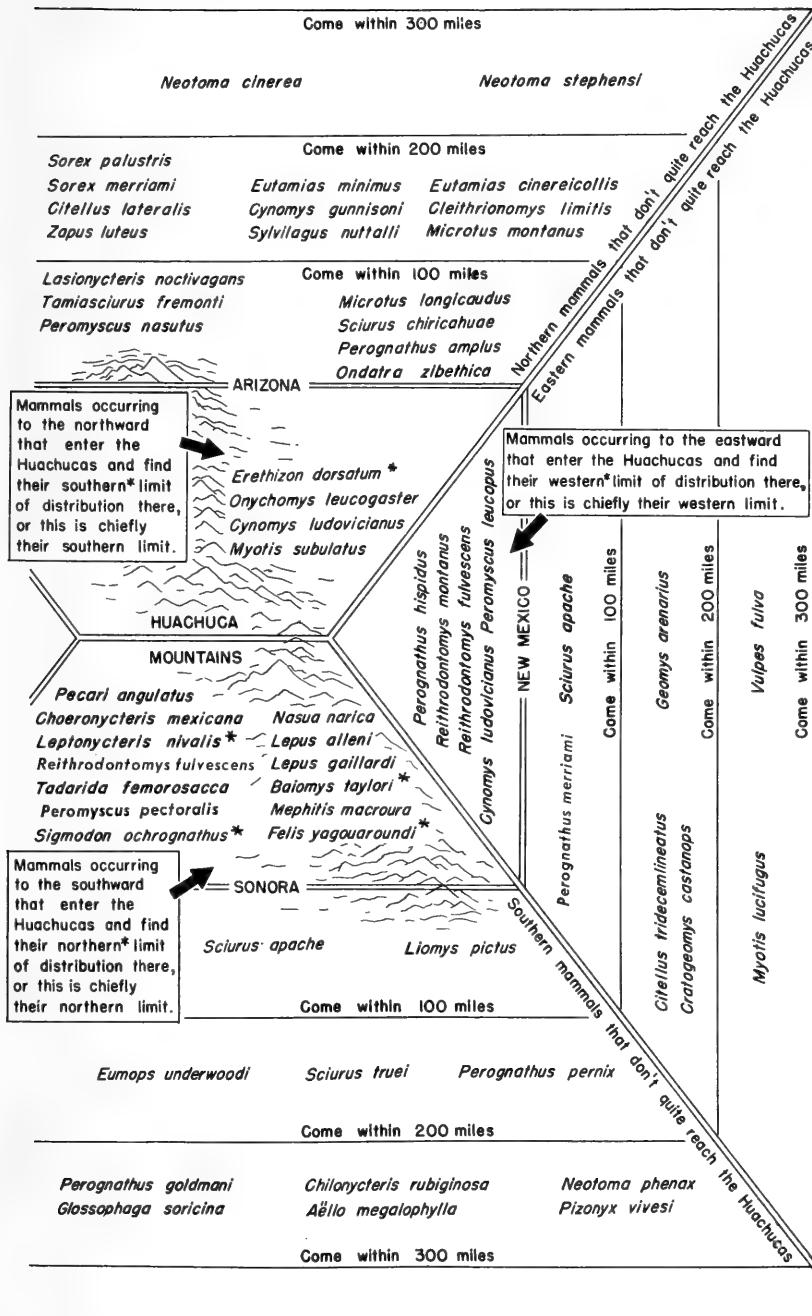


FIG. 15. Graphic portrayal of the geographical affinities of the mammalian fauna in the Huachuca Mountains.

cliff chipmunk, *Eutamias dorsalis*, are not present here. The latter occurs to the north (in the Graham Mountains), the northeast (Chiricahua Mountains), and the south (San Luis and Guadalupe mountains).

Geological Affinities of the Mammalian Fauna

Within 30 miles of the Huachuca Mountains, there are in the San Pedro River Valley mammal-bearing beds of late Pliocene (Blancan) and Pleistocene age. Studies (Gidley, 1923; Gazin, 1942) of the fossils in these beds make it possible to compare the present Huachucan mammals with the mammals of several thousands of years ago for similarities in faunal composition and morphological divergence and to learn what the general climatic and ecologic conditions were then.

Thirty-three species of fossils from the San Pedro Valley belong to families of mammals now existing in the Huachucas. Of these 33, one is specifically and subspecifically the same as the form in the Huachucas; 14 species are closely related and morphologically quite similar to Huachucan species, and 5 of these 14 may prove, on further study, to be conspecific; 9 species are possibly or probably closely related to species existing in the Huachucas; and only 9 have no closely related species there. By orders and families, these species may be summarized as follows:

Order and Family	Same Species as in Huachucas	Very Closely Related Species	Probably Closely Re- lated Species	Not a Related Species
Chiroptera: Vespertilionidae	0	1	0	0
Carnivora: Mustelidae, Canidae, Felidae	1	1	2	1
Rodentia: Sciuridae, Heteromy- idae, Geomyidae, Cricetidae	0	12	2	5
Lagomorpha: Leporidae	0	0	3	1
Artiodactyla: Tayassuidae, Cervidae, Antilo- capridae	0	0	2	2
<i>Total</i>	1	14	9	9

Seventy-three per cent of the above species are very similar to species now living in the Huachucas. The similarity is with those species in the Huachucas that occur on the alluvial fans, particularly at the lower edge of these fans. This is attested to by the presence of *Dipodomys*, *Onychomys*, *Lepus californicus*, *Baiomys*, *Sigmodon*, and *Perognathus*. The presence of a wood rat (similar to *Neotoma albigena*, but not like *Neotoma mexicana*) and a deer (similar to *Odocoileus hemionus*, but not *O. vir-*

ginianus couesi) suggests that the area was not ecologically or climatically similar to the wooded, higher portions of the Huachucas. It might be argued that the presence of rabbits similar to *Sylvilagus floridanus* is indicative of high mountain conditions, but it will be pointed out later that it is questionable whether these rabbits are more similar to *S. floridanus* or to *S. audubonii* which at the present time occurs near the base of the Mountains.

The striking similarity of so many species in these 2 areas, so little separated geographically but so greatly separated chronologically, indicates to us that mammals in this area have not been as plastic and have not diverged or changed as much as many zoologists might wish to believe.

We do not mean to imply that there were not some kinds of mammals in these fossil beds indicating considerable antiquity and a somewhat different faunal make-up. The presence of 3 mastodontids, 1 edentate, 3 kinds of extinct horses, 2 or 3 fossil camels, and 2 antilocaprids attests to this. Of the kinds of smaller mammals, the rabbit *Hypolagus*, the mouse *Bensonomys*, the cat near *Felis atrox*, and the squirrel *Citellus cochisei* have no closely related species occurring at the present time within 100 or more miles of this area. Of the 3 kinds of fossil gophers, closely related species occur within about 200 miles to the east.

The original studies of the Pliocene-Pleistocene deposits along the San Pedro Valley gave the impression that the mammalian fauna had a strong admixture of Neotropical or southern elements. This indeed may be the case. But our study of the Recent fauna of the Huachucas indicates it also has many southern species represented in it. The Pliocene-Pleistocene fauna of the San Pedro Valley basically was not too much different, as regards several families, than the present fauna. The presence of *Baiomys*, 3 species of *Sigmodon*, 2 species of *Onychomys*, peccaries, and some other forms in the Benson and Curtis Ranch beds cannot be considered as any different than the present occurrences in the Huachucas, for these same kinds and same number of species are present now.

CRITICAL COMMENTS ON CERTAIN SAN PEDRO VALLEY FOSSILS

Spilogale pedroensis Gazin.—Upper and lower teeth from the Curtis Ranch are referred to this species. Distinctive features include (1) an irregular lower margin of the lower jaw, a feature that is variable in our Recent material and, according to Gazin's figures (1942:502), nearly duplicable in some specimens and (2) lower carnassial narrowed across the protoconid-metaconid portion, which is also variable and duplicable in Recent material. Other features mentioned are not readily comparable without reference to the type material. Measurements of teeth of the fossils are similar to, but not identical with, our Recent material. The

TABLE 1. Fossil mammals of the San Pedro Valley and their related forms now living in or near the Huachucas.

Benson Beds, Blancan Pliocene	Curtis Ranch Beds, Pleistocene	Related Form Now Living in Huachucas, or Vicinity ^a	Remarks on Relationships
	<i>Simonycteris stocki</i>	<i>Eptesicus fuscus</i>	According to Stirton (1931)
	<i>Spilogale pedroensis^a</i>	<i>Spilogale putorius ambigua</i>	Probably same species and subspecies
	<i>Canis edwardii^a = Canis lupus baileyi</i>	<i>Canis lupus baileyi</i>	Same subspecies, see p. 34
Canid, sp.		?	
Felis sp.		Possibly <i>Felis onca</i>	
	<i>Felis sp., nr. F. lacustris</i>	Possibly nr. <i>Lynx rufus</i>	
	<i>Felis sp., nr. F. atrox</i>	None	
<i>Citellus bensoni^a</i>	<i>Citellus cochisei</i>	<i>Citellus variegatus</i>	May be same species
<i>Dipodomys minor^a</i>	<i>Dipodomys gidleyi^a</i>	None	
	<i>Dipodomys sp. cf. Perognathus</i>	<i>Dipodomys ordii</i>	See comments beyond
<i>Geomys minor^a</i>	<i>Nerterogeomys^a (possibly <i>Geomys</i> <i>persimilis</i>)</i>	<i>Perognathus sp.</i>	
<i>Cratogeomys (possibly <i>Geomys</i>) minor^a</i>		None	<i>Geomys</i> presently occurs within 163 miles and <i>Cratogeomys</i> within 210 miles
<i>Baiomys minimus</i>	<i>Baiomys brachygynathus</i>	<i>Baiomys taylori</i>	
<i>Peromyscus sp.</i>		Possibly <i>P. creemicus</i>	According to Gazin, 1942
<i>Bensonomys arizonae</i>		None	
<i>Onychomys bensoni^a</i>	<i>Onychomys pedroensis^a</i>	<i>Onychomys torridus</i>	
<i>Sigmodon medius^a</i>	<i>Sigmodon minor^a</i>	<i>O. leucogaster</i>	
<i>Neotoma fossilis^a</i>	<i>Sigmodon curtisi^a</i>	<i>Sigmodon hispidus</i>	May be same species
	<i>Ondatra sp.^a</i>	<i>Neotoma albogula</i>	Probably conspecific
		<i>Ondatra zibethica</i>	

TABLE 1 (Cont.). Fossil mammals of the San Pedro Valley and their forms related now living in or near the Huachucas.

Benson Beds, Blancan Pliocene	Curtis Ranch Beds, Pleistocene	Related Form Now Living in Huachucas, or Vicinity ^a	Remarks on Relationships
Hypolagus sp.	Lepus sp. (nr. <i>L. californicus</i>)	None Lepus californicus	
Leporid sp.		Lepus californicus or allenii	
Sylvilagus ? benzonensis ^a		Possibly <i>Sylvilagus floridanus</i> or <i>audubonii</i>	
	<i>cf. Sylvilagus</i> sp. (nr. <i>S. floridanus</i>) ^a	<i>Sylvilagus floridanus</i> or <i>audubonii</i>	
	<i>Glyptotherium arizonae</i>	None	
Cuvieronius benzonensis	<i>Stegomastodon arizonae</i>		
Mastodont sp.			
Nannippus cf. phlegon	<i>Equus</i> sp.		
Plesippus sp.			
Platygonus sp.		Possibly <i>Pecari tajacu</i>	
Camelid sp.	<i>Camelid</i> sp.		
	<i>Tanupolama</i> cf. <i>longurio</i>		
Antilocaprid (possibly <i>Texoceros</i> sp.)	<i>cf. Capromeryx</i>	None	
	<i>cf. Odocoileus</i> sp.	Possibly <i>Odocoileus hemionus</i>	Not <i>O. virginianus</i> <i>couesi</i>

^a Critical comments on certain species are given (see pp. 30-36).

anteroposterior diameter and transverse diameter of Pm_4 and M_1 of 6 male Huachucan *S. putorius ambigua* (minimum and maximum) and Curtis Ranch specimens 14682, 14683, U.S. Nat. Mus., are in mm., respectively: 3.2-3.3, 3.4, 3.4; 2.1-2.5, 2.0, 2.0; 6.9-7.4, 6.8, 6.2; 3.0-3.7, 2.9, 2.8. Similar measurements for 1 female from the Huachucas and fossil specimen 12869 (type) for Pm^4 and M^1 are: 5.7, 5.8; 3.5, 3.4; 4.3, 4.5; 5.1, 6.3.

S. pedroensis, in all features we can measure without the type material, is so similar to the Recent *Spilogale* in the Huachucas that when this

TABLE 2. Comparison of the teeth of the Recent wolf (*Canis lupus baileyi*) of the Huachucas and the fossil wolf (*Canis edwardii*) of the Curtis Ranch Pleistocene.
(Measurements in mm.)

Measurement	Upper Dentition				Lower Dentition			
	Fossil		Recent		Fossil		Recent	
	<i>C. edwardii</i> 12862 ^a	<i>41528^b</i> ♀	<i>4109^b</i> ♂	<i>4107^b</i> ♂	<i>C. edwardii</i> 12862 ^a	<i>41528^b</i> ♀	<i>4109^b</i> ♂	<i>4107^b</i> ♂
Approximate length of dentition from I1 to M2	115	114	115.5	120.5	113	110.2	113.9	117.5
Length of cheek teeth from P1 to M2	77	77.1	77.2	82.9	82	81.4	85.1	86.2
Length of premolars from P1 to P4	60	59.7	60.6	65.3	47.5	46.7	48.5	50.5
Length of molars from M1 to M2	22.5	22.5	24.0	22.9	36	36.3	38.7	37.2
Anteroposterior diameter of P3	15	14.5	14.7	15.7	13.5	12.6	12.9	13.5
Transverse diameter of P3	6.2	6.1	6.8	7.2	6.0	5.9	6.7	6.3
Anteroposterior diameter of P4	24.0	22.7	24.0	23.5	15.4	14.5	15.3	15.6
Transverse diameter of P4	11.7	12.8	12.6	13.0	7.4	7.4	7.5	7.7
Anteroposterior diameter of M1	14.5	15.2	16.7	15.3	25.0	25.1	27.7	25.8
Transverse diameter of M1	20.5	18.6	20.6	20.2	9.8	9.9	11.3	10.2
Anteroposterior diameter of M2	8.4	8.2	8.5	8.5	11.3	11.2	11.8	11.5
Transverse diameter of M2	12.8	12.3	12.1	12.1	8.5	7.9	8.7	7.8

^a Measurements of type of *C. edwardii*, in U.S. Nat. Mus., are taken from Gazin (1942:500).

^b Specimens of *C. lupus baileyi*, Huachuca Ms., Ariz., in the coll. of Univ. of Ill.

material is restudied it may be shown that the Recent and fossil are conspecific.

"Canis edwardii" Gazin.—Wolf remains from the Curtis Ranch were regarded as belonging to this distinct species, being intermediate in size between the timber or gray wolf (*Canis lupus*) and red wolf (*Canis niger*). In southeastern Arizona, the present gray wolves are only slightly larger than red wolves from central Texas (*C. n. rufus*), and smaller than red wolves from eastern Texas (*C. n. gregoryi*); see account of *Canis lupus baileyi*, p. 83. Thus, the Curtis Ranch material should have been compared just as critically with *Canis lupus baileyi* as with *Canis niger* (= *C. rufus* in Gazin's account). When comparisons are made with specimens of timber wolves, *C. l. baileyi*, from the Huachuca Mountains, we can find no diagnostic differences. The size of the teeth in *C. edwardii* can be matched most closely in our Recent material (see Table 2). The size and configuration of the jaw can also be closely matched; the shape of the coronoid process in *C. edwardii* can be matched perfectly in a Recent specimen, and we note no differences in the angular process. In the drawing of the jaw of *C. edwardii* (Gazin, 1942:Fig. 41), the coronoid or masseteric fossa appears to have a more pronounced lower lip than in Recent specimens, but an examination of the type might show that this lip is less pronounced than portrayed.

In view of the similarity in diagnostic features between *C. edwardii* and Recent specimens, we have deemed it advisable to regard this species as a synonym of *C. lupus baileyi*.

Citellus bensoni Gidley.—This squirrel from the Benson formation is referable to the subgenus *Otospermophilus*, judging from the accounts of Gidley (1923:122), Gazin (1942:485), and Bryant (1945:354). Since *C. variegatus* is the representative of this subgenus now living in this region, it seems desirable to make specific comparison with this species rather than with *C. beecheyi* only. In interpreting the fossil material, we regard the type as consisting of part of a left Pm^4 , left M^3 , and right Pm^4 , not an M^1 . Judging from Gidley's figures (1923), the teeth of *C. bensoni* correspond closely in discernible details with those of *C. variegatus grammurus* now in the Huachucas. The measurement of 10.3 mm. for the length of the lower toothrow for *C. bensoni* is less than in Recent material, in which the crown length varies from 10.6 to 11.4 mm. and the alveolar length from 11.3 to 11.6 mm. However, the length of the occlusal surface is from 9.7 to 10.3 mm. in Recent specimens. If *C. bensoni* is not conspecific with *C. variegatus*, it is close to this species.

Dipodomys minor Gidley.—This species of kangaroo rat from the Benson was referred to *Dipodomys* by Gidley (1927:123) and Wood (1935:155) but was questionably referred to Hibbard's (1939:458)

Prodipodomys by Gazin (1942:486). Evidence for reference of this species to *Prodipodomys* on the number of roots on the cheek teeth is not strong, and we prefer to follow others in regarding this species as belonging to the genus *Dipodomys*. Wood (1935:156) has pointed out that *D. minor* is most similar to the Recent *D. compactus*, and Setzer (1949) regards *D. compactus* as conspecific with *D. ordii*.

Dipodomys gidleyi Wood.—From the Curtis Ranch, *D. gidleyi* was regarded by Wood (1935:159) as either ancestral to *Dipodomys ordii* or close to such an ancestral position. Setzer (1949:484) intimates that *D. gidleyi* is not as closely related to the Recent *D. ordii* as is *D. minor*. He gives no reasons for this conclusion.

Nerterogeomys persimilis (Hay).—This Curtis Ranch form is very close to *Geomys*, particularly in the grooving of the upper incisors. Some features which may be distinctive are the shape of the anterior column of the premolars, position of the mental foramen, and position of the enamel in Pm^4 . *Geomys* (*G. arenarius arenarius*) occurs at the present time within 163 miles of Benson, Arizona.

Geomys minor Gidley.—*G. minor* from the Benson formation is based on a lower jaw and upper incisor. The referred upper incisor seems similar to this tooth in *Geomys*, and there seem to be no features requiring that this form be referred to the questionable *Nerterogeomys*.

Cratogeomys bensoni Gidley.—This species was referred to *Cratogeomys* by Gidley (1923) on the basis of the single groove in the upper incisor. Gazin (1942:488) points out that in addition to the median groove, there is a slight inner groove on the incisor. Although this is similar to *Geomys*, the groove is not as strong as in that genus. Could it be that the groove has been partly abraded through the years? Living representatives of the genus *Cratogeomys* (*C. castanops lacrimalis*) are found within 220 miles of Benson, Arizona, and *Geomys* occurs even closer (163 miles away).

Onychomys bensoni Gidley.—A jaw from the Benson formation is regarded as close to the Recent *Onychomys torridus*. On size of teeth, it fits this closely: toothrow in Huachucan *torridus*, 3.3 to 3.8 mm.; in *bensoni*, 3.9 mm. The greatly reduced M_3 is as in *torridus*, and in contrast to the other Recent species, *O. leucogaster*.

Onychomys pedroensis Gidley.—This Curtis Ranch form is near to the Recent *O. leucogaster*. The toothrow is 4.5 mm.; in Huachucan *O. leucogaster*, 4.1 to 4.5 mm.

Sigmodon (medius, curtisi, minor).—*S. medius* and *S. minor* have small teeth which are more brachydont and less hypsodont than the Recent *S. hispidus*. In this respect they are similar to the Recent *S. minimus* of the Huachucas.

S. curtisi has teeth of the same size as in *S. hispidus* with hypsodont condition as in *S. hispidus*. Since there is considerable variation in dental pattern in our Recent species, we wonder if *S. curtisi* does not fall within the extremes of variation of *S. hispidus* and if the two might be conspecific.

Neotoma fossilis Gidley.—Judging from Gidley's (1923) figure of M¹, this tooth from the Benson formation is comparable to *Neotoma albicula* occurring near the base of the Huachuca Mountains. It is not similar to *Neotoma mexicana* occurring high in the Mountains. The fossil material seems so similar to *N. albicula* that we suspect *N. fossilis* and *N. albicula* are the same species.

Ondatra sp.—*Ondatra zibethica pallida* formerly occurred in the San Pedro River in Cochise County (see Mearns, 1907:496). The material from the Curtis Ranch resembles *O. zibethica* in many features, according to Gazin (1942).

Cf. Sylvilagus sp., near *Sylvilagus floridanus*.—This fragment from the Curtis Ranch might be referred to *S. audubonii* as readily as to *S. floridanus*. We know of no way for distinguishing between these 2 species by teeth alone. *S. audubonii* occurs in this region today; *S. floridanus*, high in the Mountains.

Sylvilagus? *benzonensis* Gazin.—This mandible, questionably from the Benson formation, is near *S. audubonii* and *S. floridanus*. If the amount of variation in the teeth of *audubonii* or *floridanus* were known, it might be shown that this variation covers the ascribed differences in enamel pattern in teeth of *S.?* *benzonensis*.

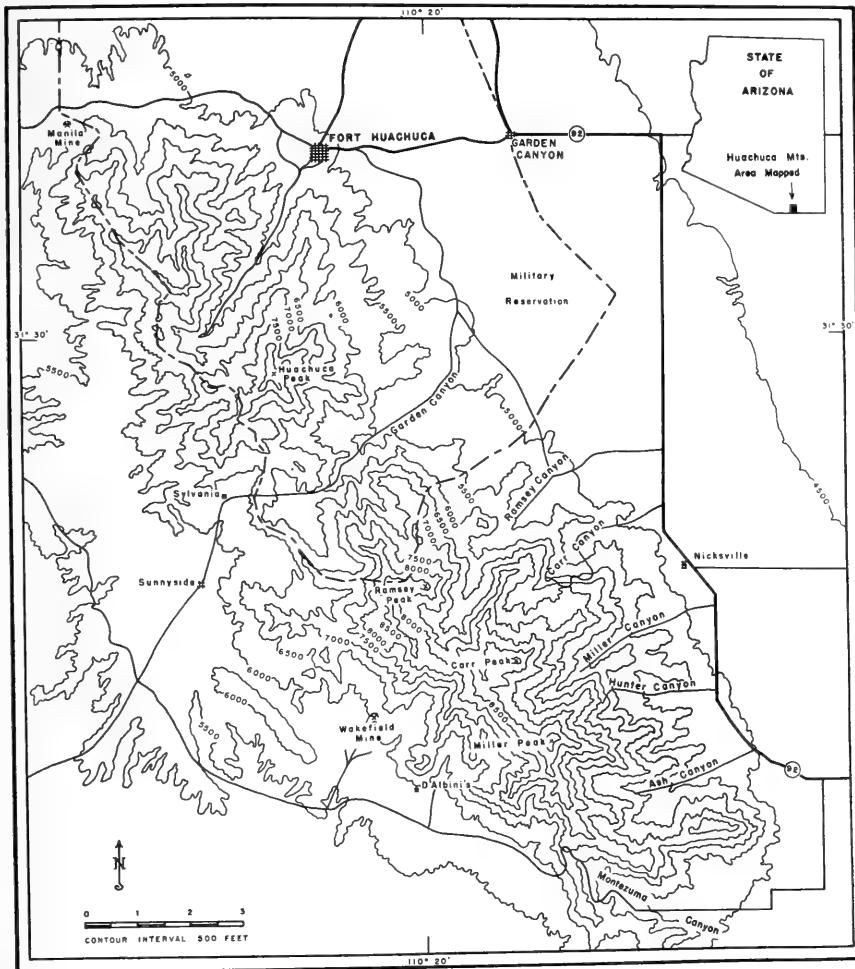


FIG. 16. Map of the Huachuca Mountains, showing contours and some place names.

Gazetteer of Localities

ASH CANYON, southeast slope, 6 mi. E, 11 mi. S Fort Huachuca.

BEAR (CREEK) CANYON, southwest slope, 1 mi. E, 11½ mi. S Fort.

BLACKTAIL CANYON, north slope, approx. 2½ mi. W, ¾ mi. N Fort.

BROKEN ARROW RANCH, mouth Miller Canyon, approx. 5100 feet.

BROWN CANYON, eastern slope, about 1 mi. N Ramsey Canyon. Collecting done near pond and house near mouth, about 4975 feet.

CANELO CAVE, MINE (also known as MANILA), natural cave and mine shaft at north base of Mountains, near road and Caneo Gate, 4¾ mi. W, ¾ mi. N Fort.

CANELO (sometimes written CANILLE) GATE, northwest entrance into military reservation, 5 mi. W, 1 mi. N Fort.

CARR CANYON, MOUTH, east slope, 5 mi. E, 8 mi. S Fort. Collecting done on alluvial fan, below oaks, about 5200 feet. A road continues up and around this canyon beyond its head and to Carr Canyon Reef. See Fig. 5.

CARR CANYON REEF, near head of Carr Canyon, about 7200 feet. Mining operations are carried on here now. See Fig. 6.

CARR PEAK, northwest slope. Collecting done in meadow-like opening, locally known as the "Cabbage Patch," approx. 8400 feet. See Fig. 6.

CAVE CREEK CANYON, southwest slope, just south of Bear Canyon, 2 mi. E, 12 mi. S Fort.

COPPER GLANCE CANYON, principal tributary to Sunnyside Canyon; flows from east to west; joins Sunnyside Canyon about 1 mi. above Sunnyside.

COPPER CANYON, southern end of Mountains, 4 mi. E, 13 mi. S Fort.

COW CANYON, principal tributary to Copper Glance Canyon; flows westward from Ramsey Peak to join Copper Glance Canyon just below old Copper Glance Mine.

COYOTE CANYON, small canyon on north end of Mountains, just west of Split Rock Canyon; mouth about 1½ mi. NW Fort; drains northeast.

D'ALBINI, ranch at mouth of Cave Creek Canyon, formerly Sutherlands Ranch, about 5875 feet.

ELDRIDGE MINE, southeast slope, just south of mouth of Ash Canyon, about 5200 feet.

"FLATS," 7 mi. ESE Fort and 8 mi. SE Fort, collecting site along west side of Highway 92.

FORT HUACHUCA, community at north end of Mountains, consisting of several hundred buildings, 5060 feet.

FRY, a community of a few buildings on Highway 92, about 1 mi. E town of Garden Canyon and 5 mi. E Fort.

GARDEN CANYON, TOWN, small community at main northeast gate of military reservation, 3½ mi. E Fort, 4618 feet.

GARDEN CANYON (formerly **TANNER CANYON**), intermittent stream flows northeast; canyon situated about midway between Huachuca and Ramsey peaks; head of Canyon at about 7000 feet; road up canyon only one that crosses crest and continues on to west side except for Montezuma Canyon Road.

HARPER MINING PROPERTIES, including several mine shafts, west slope near mouth of Bear Canyon.

HEALY'S, ranch in Carr Canyon, at upper end of alluvial fan, about 5350 feet. See Fig. 6.

HEREFORD, 7 TO 9 MILES WEST, ½ to 2½ mi. E Nicksville.

HUACHUCA (= **POST**) **CANYON**, heads near Fort, drains northward.

IGO'S RANCH, now Pyeatt Ranch, 6½ mi. W, 1 mi. N Fort.

LONE MOUNTAIN, semi-isolated mountain "range," 2½ mi. long, ½ mi. wide, along southwestern base of Huachucas, 11 mi. S, 1 mi. W Fort. See Fig. 9.

MANILA MINE, see **CANELO CAVE (MINE)**.

MC CLURE CANYON, principal north fork of Garden Canyon draining most of south side of Huachuca Peak; drains southeastward.

MILLER CANYON, east slope, 6 mi. E, 8½ mi. S Fort. See Fig. 3.

"**HALF-WAY UP**," approx. 6100 feet, where water is removed from Miller Creek.

HEAD, near saddle between Carr and Miller peaks; forest service cabin situated here. See Figs. 3, 4.

MOUTH, portion of the alluvial fan below 5100 feet and extending to eastside of Highway 92.

MONTEZUMA CANYON, southeast end, within 1 mi. of International Boundary; traversed by road to west side of Mountains.

NICKSVILLE, store, cabins, airport, on bajada between Carr and Miller canyons, approx. 4850 feet.

PANAMA MINE, name sometimes applied to Canelo Mine, but according to Charles Wallmo should be used for mine in Brown Canyon.

PETERSON'S RANCH (= **SYLVANIA**), ranch with ponds and springs, 2 mi. N Sunnyside or 6 mi. S, 1½ mi. W Fort. See Fig. 10.

POST GARDEN, no longer in use, but formerly near mouth of Garden (Tanner) Canyon.

RAMSEY (= RAMSAY) CANYON, eastern slope with creek running in north-easterly direction. Collecting done at mouth of canyon, 6 mi. E, 6 mi. S Fort, between 4750 and 4950 feet.

SAWMILL CANYON, tributary from head of Garden Canyon; drains northwest from Ramsey Peak; site of early logging operations and Bear Spring.

SCOTIA CANYON, heads between Sylvania and Sunnyside; drains westward to near Lincoln Hathaway's Ranch.

SEEMAN'S (LOUIS), mine operator, see CARR CANYON REEF.

SHEELITE CANYON, principal south fork of Garden Canyon draining north side of Ramsey Peak; drains to north.

SPLIT ROCK CANYON, first large canyon west of Huachuca Canyon; named for a mountain in center of canyon with a quartzite face with a prominent cleft.

SUNNYSIDE, several houses and other buildings, now abandoned, of a once thriving community, west slope, 5800 feet, 2½ mi. W, 8 mi. S Fort.

SUTHERLAND PEAK, semi-isolated peak, southwest slope, between Bear and Cave Creek canyons, 2 mi. E, 11½ mi. S Fort.

SYCAMORE CANYON, north slope, 1 mi. E Manila or Canelo Mine or 4 mi. W, 1 mi. N Fort.

SYLVANIA, see PETERSON'S RANCH.

TANNER CANYON (= GARDEN CANYON).

WAKEFIELD MINE, western slope, 10 mi. S, 1 mi. E Fort, about 6000 feet.

Check List of Mammals of the Huachucas

Order Marsupialia—marsupials

Didelphis marsupialis californica Bennett Opossum

Order Insectivora—insectivores

Sorex vagrans monticola Merriam Vagrant Shrew
Notiosorex crawfordi crawfordi (Coues) Desert Shrew

Order Chiroptera—bats

<i>Choeronycteris mexicana</i> Tschudi	Long-tongued Bat
<i>Leptonycteris nivalis nivalis</i> (Saussure)	Long-nosed Bat
<i>Myotis yumanensis yumanensis</i> (H. Allen)	Yuma Myotis
<i>Myotis velifer velifer</i> (J. Allen)	Cave Myotis
<i>Myotis evotis evotis</i> (H. Allen)	Long-eared Myotis
<i>Myotis thysanodes thysanodes</i> Miller	Fringe-tailed Myotis
<i>Myotis volans interior</i> Miller	Hairy-winged Myotis
<i>Myotis californicus californicus</i> (Audubon and Bachman)	California Myotis
<i>Myotis subulatus melanorhinus</i> (Merriam)	Small-footed Myotis
<i>Pipistrellus hesperus maximus</i> Hatfield	Western Pipistrel
<i>Eptesicus fuscus pallidus</i> Young	Big Brown Bat
<i>Lasiurus cinereus cinereus</i> (Beauvois)	Hoary Bat
<i>Lasiurus borealis teliotis</i> (H. Allen)	Red Bat
<i>Corynorhinus rafinesquii pallescens</i> Miller	Long-eared Bat
<i>Antrozous pallidus pallidus</i> (LeConte)	Pallid Bat
<i>Tadarida femorosacca</i> (Merriam)	Pocketed Free-tailed Bat

Order Carnivora—carnivores

<i>Ursus americanus amblyceps</i> Baird	Black Bear, "Brown" Bear
<i>Procyon lotor mexicanus</i> Baird	Raccoon
<i>Nasua narica molaris</i> Merriam	Coati-mundi, Chula
<i>Bassariscus astutus arizonensis</i> Goldman	Ring-tailed Cat
<i>Spilogale putorius ambigua</i> Mearns	Spotted Skunk
<i>Mephitis mephitis estor</i> Merriam	Striped Skunk
<i>Mephitis macroura milleri</i> Mearns	Hooded Skunk
<i>Conepatus mesoleucus venaticus</i> Goldman	Hog-nosed Skunk
<i>Taxidea taxus sonoriensis</i> Goldman	Badger

<i>Vulpes macrotis neomexicana</i> Merriam	Kit Fox
<i>Urocyon cinereoargenteus scottii</i> Mearns	Gray Fox
<i>Canis latrans mearnsi</i> Merriam	Coyote
<i>Canis lupus baileyi</i> Nelson and Goldman	Gray Wolf, Timber Wolf
<i>Felis onca arizonensis</i> Goldman	Jaguar
<i>Felis concolor azteca</i> Merriam	Mountain Lion, Puma
<i>Herpailurus yagouaroundi cacomitli</i> Berlandier	Jaguarundi
<i>Lynx rufus baileyi</i> Merriam	Bobcat

Order Rodentia—rodents

<i>Citellus spilosoma canescens</i> (Merriam)	Spotted Ground Squirrel
<i>Citellus variegatus grammurus</i> (Say)	Rock Squirrel
<i>Cynomys ludovicianus arizonensis</i> Mearns	Black-tailed Prairie Dog
<i>Sciurus arizonensis huachuca</i> Allen	Arizona Gray Squirrel
<i>Thomomys bottae intermedius</i> Mearns	Western Pocket Gopher
<i>Thomomys bottae proximus</i> Burt and Campbell	Western Pocket Gopher
<i>Thomomys bottae hueyi</i> Goldman	Western Pocket Gopher
<i>Perognathus flavus flavus</i> Baird	Silky Pocket Mouse
<i>Perognathus hispidus conditi</i> Allen	Hispid Pocket Mouse
<i>Perognathus penicillatus pricei</i> Allen	Desert Pocket Mouse
<i>Perognathus intermedius intermedius</i> Merriam	Rock Pocket Mouse
<i>Dipodomys ordii ordii</i> Woodhouse	Ord Kangaroo Rat
<i>Dipodomys merriami merriami</i> Mearns	Merriam Kangaroo Rat
<i>Dipodomys spectabilis spectabilis</i> Merriam	Banner-tailed Kangaroo Rat
<i>Onychomys leucogaster ruidosae</i> Stone and Rehn	Northern Grasshopper Mouse
<i>Onychomys torridus torridus</i> (Coues)	Southern Grasshopper Mouse
<i>Reithrodontomys montanus montanus</i> (Baird)	Plains Harvest Mouse
<i>Reithrodontomys megalotis megalotis</i> (Baird)	Western Harvest Mouse
<i>Reithrodontomys fulvescens fulvescens</i> Allen	Fulvous Harvest Mouse
<i>Baiomys taylori ater</i> Blossom and Burt	Pigmy Mouse
<i>Peromyscus maniculatus sonoriensis</i> (LeConte)	Deer Mouse
<i>Peromyscus maniculatus rufinus</i> (Merriam)	Deer Mouse
<i>Peromyscus leucopus arizonae</i> (Allen)	White-footed Mouse

<i>Peromyscus boylii rowleyi</i> (Allen)	Brush Mouse
<i>Peromyscus pectoralis eremicoides</i> Osgood	White-ankled Mouse
<i>Peromyscus eremicus eremicus</i> (Baird)	Cactus Mouse
<i>Sigmodon hispidus cienegeae</i> (A. B. Howell)	Hispid Cotton Rat
<i>Sigmodon minimus minimus</i> Mearns	Least Cotton Rat
<i>Sigmodon ochrognathus montanus</i> Benson	Yellow-nosed Cotton Rat
<i>Neotoma albicula albicula</i> Hartley	White-throated Wood Rat
<i>Neotoma mexicana mexicana</i> Baird	Mexican Wood Rat
<i>Rattus rattus rattus</i> (Linnaeus)	Black Rat
<i>Mus musculus musculus</i> Linnaeus	House Mouse
<i>Erethizon dorsatum couesi</i> Mearns	Porcupine

Order Lagomorpha—hares, rabbits

<i>Lepus californicus eremicus</i> Allen	Black-tailed Jack Rabbit
<i>Lepus gailliardi gailliardi</i> Mearns	Gaillard's Jack Rabbit
<i>Sylvilagus audubonii arizonae</i> (Allen)	Desert Cottontail
<i>Sylvilagus floridanus holzneri</i> (Mearns)	Eastern Cottontail

Order Artiodactyla—even-toed ungulates

<i>Pecari tajacu sonoriensis</i> (Mearns)	Collared Peccary, Javelina
<i>Odocoileus hemionus crooki</i> (Mearns)	Mule Deer
<i>Odocoileus virginianus couesi</i> (Coues and Yarrow)	White-tailed Deer
<i>Antilocapra americana</i> (cf. <i>mexicana</i> Merriam)	Pronghorn

Hypothetical

<i>Tadarida mexicana</i> Saussure	Mexican Free-tailed Bat
<i>Mustela frenata neomexicana</i> (Barber and Cockerell)	Long-tailed Weasel
<i>Felis pardalis sonoriensis</i> Goldman	Ocelot
<i>Tamiasciurus fremonti</i> (cf. <i>grahamensis</i> Allen)	Chickaree
<i>Ovis canadensis mexicana</i> Merriam	Bighorn

Adjacent to the Huachucas

<i>Citellus harrisii harrisii</i> (Audubon and Bachman)	Yuma Antelope Ground Squirrel
<i>Castor canadensis frondator</i> Mearns	Beaver
<i>Lepus allenii allenii</i> Mearns	Antelope Jack Rabbit

Account of Species

Didelphis marsupialis californica Bennett

OPOSSUM

Didelphis californica Bennett, Proc. Zool. Soc. London, 1833:40.
Sonora, Mexico (as restricted by Hershkovitz, Fieldiana: Zool-
ogy, 31:550, 1951).

Records of occurrence.—Reported at D'Albini's, southern end of Huachucas (see *Remarks*).

Remarks.—Mr. D'Albini killed an opossum in the orchard on his ranch about 1947, according to his report to us on August 20, 1950. He volunteered this information, indicating that the opossum was about half-grown and very similar to opossums seen by him in Texas. From his description there was little question but that he was referring to *Didelphis*. Although the D'Albini family has lived in the southern end of the Huachucas for many years, to Mr. D'Albini's knowledge this was the first opossum seen or killed there.

In an account of the mammals of Sonora, Burt (1938:18) records *Didelphis mesamericana mesamericana* (= *D. marsupialis californica*) from within 80 miles (Llano) and 110 miles (Opoto) of the southern end of the Huachucas. To us it seems very likely that this species could well range, on occasions, into the Huachucas. However, everyone else we talked with had no information or had ever seen opossums in other parts of the Huachucas. Continued search for this mammal in the Mountains is imperative. It may very likely not show up again for several years, for we do not consider this opossum as an established resident. Perhaps it would be best regarded as a visitant.

Hock (1952) reviewed the introduction of the Virginia opossum (*Didelphis marsupialis virginiana*) in Arizona after the above was written. This species reportedly was released or escaped near Tucson, at Apache Junction, and in the White Mountains. Hock cites a letter indicating that opossums were seen near Nogales and Patagonia. Specimens were not collected at either of the latter two places by him, so it is not definitely known if the observations were of the introduced *D. m. virginiana* or of the southern *D. marsupialis californica*. There is a strong possibility that the specimen at the southern end of the Huachucas may have been an offspring from the introduced *Didelphis marsupialis virginiana* Kerr.

Sorex vagrans monticola Merriam**VAGRANT SHREW**

Sorex monticolus Merriam, No. Amer. Fauna, 3:43, 1890. San Francisco Mountain, 11,500 feet, Coconino Co., Arizona.

Sorex vagrans monticola, Merriam, No. Amer. Fauna, 10:69, 1895.

Records of occurrence.—Miller Canyon, along stream at lower edge of Douglas fir zone, 5¹; "Huachuca Mountains, 1" (Jackson, 1928:112).

Comparisons.—The specimens are light grayish brown above, light gray washed with light brown below, hind feet whitish, tail bicolor (sharply so in two specimens), third unicuspid not smaller, but as large or larger, than fourth unicuspid. Otherwise, the specimens are similar to *Sorex vagrans monticola* to the northward.

Measurements (all measurements are in millimeters).—Two males¹, 3 females¹ are: total, 113, 107, 114, 107, 108; tail, 40, 44, 46, 44, 45; hind foot, 12, 12, 13, 13, 13; ear, 8, 8, 8, 8, 8; condylobasal length, 16.5, —, 16.5, 16.7, —; palatal length, 7.0, —, 7.0, 7.15, 6.7; cranial breadth, 8.0, —, 8.2, 8.2, —; interorbital breadth, 3.6, —, 3.65, 3.6, 3.5; maxillary breadth, 5.1, —, 5.1, 5.3, 5.1; length of maxillary toothrow, 6.05, 6.0, 6.0, 6.3, 6.1.

Remarks.—All of our specimens of *Sorex vagrans* were taken in the deep, cool part of Miller Canyon. Four were taken in a thicket of horse-tail (*Equisetum*) near a spring in dense woodland of oak, walnut, maple, sycamore, and some Douglas fir. This spot was only a short distance above the place where water is removed from Miller Creek for piping to Tombstone, Arizona. Leaf-mold was 12 to 14 inches deep in places. The only other small mammals obtained here were *Peromyscus boylii* and *Peromyscus leucopus*. The *Equisetum* was so dense in this thicket that in many places it was necessary to break it down forcibly to find room to set a trap. However, the slopes above the stream were drier, with some *Agave* and cacti growing here.

Nearly a mile farther up the canyon, where the bottom of the canyon is somewhat broader, another shrew was taken in the thick woodland where numerous large boulders were present. Large pines, walnuts, oaks, and maples predominated here.

Some of the larger mammals associated with the vagrant shrews along this canyon were the gray squirrel, *Sciurus arizonensis*, coati-mundi, *Nasua narica*, hog-nosed skunk, *Conepatus mesoleucus*, and spotted skunk, *Spilogale putorius*.

These shrews were caught in museum special traps baited with a

¹ The superior numbers in *Records of occurrence* and corresponding superior numbers in *Measurements* indicate that these measurements are based on specimens (usually adults) from the localities so marked.

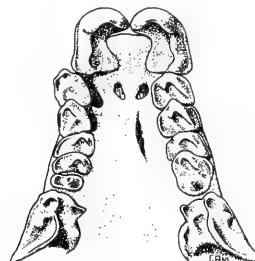


FIG. 17. Palatal view of rostral portion of the skull of *Sorex vagrans monticola*, No. 3811. Note that there are only 4 left unicuspids (the left unicuspids are on the right-hand side in this ventral view), with unicuspids 4 and 5 joined together as a single tooth. Right unicuspids 1 and 2 are pushed far laterally. X 5.

specially prepared mixture of smoked fat pork, mixed with peanut butter and some rolled oats.

The dentition in 2 of the skulls shows marked abnormalities: in 3811, the unicuspids in the left upper jaw number only 4, because unicuspids 4 and 5 are fused together as a single tooth (see Fig. 17). The details of each unicuspis are evident even though they are so joined together. In the right upper jaw, unicuspids 1 and 2 are pushed far labially. This has resulted from infection near the base of these teeth (see Fig. 17). In 3810, the right upper unicuspis 1 is absent, apparently the result of decay; the right upper unicuspis 4 has curved far out of line so as to be on the labial side of the unicuspis row.

Notiosorex crawfordi crawfordi (Coues)

DESERT SHREW

Sorex (Notiosorex) crawfordi Coues, Bull. U. S. Geol. and Geogr. Surv. Terr., 3:651, 1877. Near old Fort Bliss, about 2 miles above El Paso, El Paso Co., Texas.

Notiosorex crawfordi, Merriam, No. Amer. Fauna, 10:32, 1895.

Records of occurrence.—Mouth of Ramsey Canyon, 3; mouth of Carr Canyon, 3; mouth of Miller Canyon, 1 (in alcohol). Other sight records listed under *Remarks*.

Comparisons.—Judging from the various descriptions of other specimens of *Notiosorex crawfordi crawfordi* from Texas, California, and Nevada, our material falls within the range of variation of this subspecies. Actually, the specimens from the Huachucas are from within 230 miles of the type locality and probably represent the largest series from anywhere within the range of the subspecies. All 7 of our specimens were taken within 3 miles of each other.

To our eye, the 6 skins vary in dorsal coloration from a silvery gray

through a brownish gray to a blackish gray. One specimen (3814) seems much paler than the others. This specimen seems to be in poor, worn pelage, and the tips of some of the hairs seem to be worn off. This condition may be responsible in part for the resulting light grayish coloration. Two specimens are quite blackish and 2 are quite brownish. These animals may show color dimorphism, and the 2 phases may be represented in these specimens.

Variation in the configuration of the pterygoid bones and the rostrum, as pointed out by Fisher (1941), between a specimen from Nevada and those from southern California, apparently is duplicated in some degree in our specimens. Two of our specimens seem to have the broader pterygoids figured by him, one the narrower, and 3 the intermediate. In none of our specimens does the rostrum turn ventrad as abruptly as he pictures it for the Nevadan specimen, but 2 of our specimens show approach toward this configuration.

Measurements.—See Table 3.

Remarks.—The desert shrew, *Notiosorex crawfordi*, has been considered one of the rarest North American shrews, although our experiences in the Huachuca Mountains would indicate it was uncommon but not rare here. *Notiosorex* in the Huachucas prefers the dry alluvial fans or aprons which are grown up with grasses, some cacti, and much *Agave*. This is in a belt above the "Dipodomys-zone" but below the tree (oak) zone.

The many dead *Agave* plants in this "intermediate zone" provide ideal shelter and sources of food for *Notiosorex*. Beneath such *Agave* plants, the soil is loose, more moist than any of the surrounding soil, and usually has a good number of invertebrates such as grubs, ants, beetles, centipedes, and spiders. It would be nearly impossible for any carnivorous animal to uncover a small mammal that took refuge beneath a large *Agave*, even though it was a dead plant. Yet we could find no mammals other than *Notiosorex*, in this zone, that took refuge under the dead *Agave* plants.

In the mouth of Carr Canyon, in the appropriate zone (see Figs. 5, 18), 3 *Notiosorex* were caught alive under large, dead *Agave*. The first was caught August 11, 1950, in the course of turning over all objects in search for mammals. The next day, another was caught about 120 yards west of the original capture. On August 24, 1952, a concentrated search for *Notiosorex* was made by turning over hundreds of *Agave* plants in Carr Canyon. A third specimen was secured about 130 yards to the north of the original capture. The uninhabited nest of another *Notiosorex* was uncovered. The association of *Notiosorex* and large, dead *Agave* plants seems so definite to us that we feel confident many shrews could



FIG. 18. Nesting site of *Notiosorex crawfordi crawfordi* at the mouth of Carr Canyon. It is on the ground beneath overturned agaves (such as shown in the foreground) that 3 nests were found. Other plants here, besides *Agave*, are side oats grama, beard grass, and plains lovegrass. The general area where this agave plant was located is shown in Fig. 5. Photographed August, 1950, by D. F. Hoffmeister.

be obtained in this zone by overturning these plants. A strong, quick thrust is necessary to turn the entire plant over the very first time, in order to expose all of the ground below the plant and to reveal a suddenly bewildered shrew. If the plant is slowly kicked apart, the shrew may have time to escape beneath another plant. We usually placed the toe of our boot beneath the plant and then raised and shoved it over. Once we used a strong hoe and rake to pull the plants over.

In the mouth of Ramsey Canyon, *Notiosorex* again occurred in that zone above the *Dipodomys* but below the oaks, although in a different situation than in Carr Canyon. Here the desert shrews were present beneath building materials (lumber, doors, roofing paper, sheet iron) that had been lying on the ground for several years. This material was on the ranch of Roy Newman. Many hours were spent by us and others shifting these piles of materials in order to search the ground beneath. On August 1, 1950, William Woodin captured a desert shrew here; on August 13, 1950, Roy Newman captured one; on August 24, 1950, we captured a desert shrew here and another was seen but escaped. Four *Notiosorex* in one area 60 feet square! Small runways, undoubtedly used by *Notiosorex*, were found under some of the doors, flat on the ground. The runs were no more than an inch wide and a half-inch deep. A nest was on the surface of the ground but under a stack of galvanized iron sheets. The nest was about $\frac{2}{3}$ -pint in volume and of fine-textured material, including some hair. Other mammals with nests under the building materials were 1 *Citellus variegatus*, 1 *Neotoma albicula*, and 1 or 2 *Peromyscus boylii*. Numerous wasps had nests in the piles of lumber, and we had to stop moving the lumber on several occasions to catch the wasps in self-protection. Knowing of the association of the desert or gray shrew and beehives in central California (Dixon, 1924), one wonders if there might be any correlation here between desert shrews and wasps. The combs of the wasps were fairly abundant in some parts of the area.

In the mouth of Miller Canyon, a *Notiosorex* was seen by Goodpaster on August 27, 1950, under some boards in a grassy area. It was impossible to capture the shrew then and further search failed to reveal its presence. Another *Notiosorex* was captured in a museum special trap about 100 yards away on August 26. This was the only specimen taken in a trap. It was badly decomposed and eaten when removed and was later preserved in alcohol. Mammals associated with *Notiosorex* here were *Sigmodon hispidus*, *Perognathus hispidus*, *Perognathus penicillatus*, *Peromyscus boylii*, *Peromyscus maniculatus*, and *Mephitis macroura*. The latter was taken under a fallen door which was alongside the board where the *Notiosorex* was seen.

In one month, August, 1950, 9 *Notiosorex* were seen or caught by us. Undoubtedly, the number of these small shrews in the Huachucas must

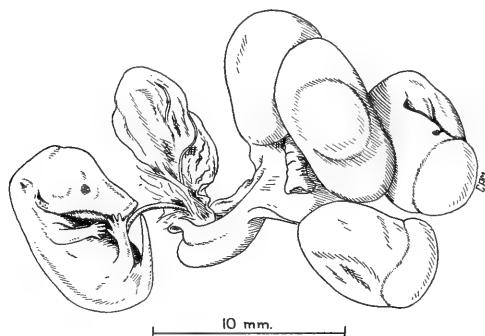


FIG. 19. An embryo of *Notiosorex crawfordi crawfordi*, probably near full term, removed from the amniotic sac, showing relative development of appendages and some sensory organs. Four embryos are still in the amniotic sacs.

be in the hundreds. Further refinement of collecting techniques may prove that this estimate is not high.

In captivity a desert shrew slept so deeply in a curled-up ball that it was taken to be dead. It was necessary to shake the cage vigorously or prod the shrew to arouse it, and even then it only gradually and sluggishly aroused itself. An animal that sleeps so soundly, oblivious to numerous noises and movements, must be accustomed to a retreat of considerable security.

One female collected August 12 was lactating but without embryos; a female collected August 24 contained 5 embryos. This specimen had 3 pair of mammae, all of which were inguinal. The crown-rump length of the embryos in the amniotic sac was 9 mm. One embryo, after removal from the sac and after preservation in alcohol, had the following measurements: total length, 22.3 mm.; tail-length, 2.0 mm. The hind foot was less than 2 mm. in length. The volume of the embryos, in the amniotic sac and with placenta attached, was 0.9 cubic centimeters. The pinna of the ear was not evident, and the pigmentation of the eye was apparent beneath the skin (see Fig. 19). As small as these embryos were, we would suspect that they were near full term.

Three skeletons (3812, 3814, 3816) of *Notiosorex* provided the following data: 7 cervical, 13 thoracic, 6 lumbar, and 5 sacral vertebrae. One specimen has 13 caudal vertebrae; 2 other specimens have 11 caudals, but 1 or 2 vertebrae may be missing from the tip on these 2. Of the 13 ribs, only one is a floating rib.

Choeronycteris mexicana Tschudi

LONG-TONGUED BAT

Choeronycteris mexicana Tschudi, Fauna Peruana, p. 72, 1844.
"Mexico."

TABLE 3. Measurements, in millimeters, of *Notiosorex crawfordi*, chiefly from the Huachuca Mountains.

Cat. No.	Sex	Locality	Total length	Body length	Tail length	Hind foot	Ear from notch	Condylo- basal length	Palatal length	Cranial breadth	Inter- orbital breadth	Maxil- lary breadth	Maxil- lary toothrow
3813	♂	Carr Canyon	77	48	29	11	8	16.5	7.15	8.5	3.6	5.1	6.2
3817	♂	Ramsey Canyon	85	60	25	10	9	15.7	6.5	8.2	3.8	5.1	5.8
3814	♀	Carr Canyon	81	55	26	9.5	8	15.75	6.3	7.8	3.7	5.1	5.8
3812	♀	Carr Canyon	83	59.5	23.5	11	8	16.0	6.5	8.8	3.85	5.2	6.0
3816	♀	Ramsey Canyon	88	63	25	11	8	15.9	6.5	8.2	3.65	5.1	5.85
3815	♀	Ramsey Canyon	90	65	25	9	... ^d	16.2	6.6	8.4	3.7	4.9	5.9
av. 4	♀		85.5	60.6	24.9	10.1	8	16.0	6.5	8.3	3.7	5.1	5.9
av. 5	♂, ♀	So. Calif. ^a	85.6	60.0	25.6	10.4	...	...	...	...	...	...	...
1	♂	SW. Nevada ^b	89	63	26	10	8	16.5	6.9	8.2	3.8	4.9	5.9
1	♀	W. Texas ^c	88	63	25	10	6.5	...	...	8.0	4.1	...	...

^a Dixon (1924).^b Hall (1946).^c Borell and Bryant (1942).^d No information available.

Records of occurrence.—Miller Canyon, 11 (4 in Chicago Nat. Hist. Mus.); Canelo Mine, 1; Ash Canyon, 21; mine, 11 mi. S Fort, 11; Eldridge Mine, 1.

Comparisons.—Our specimens have been compared with specimens from Oaxaca, Oaxaca; Cuernavaca, Morelos; and Querendero, Michoacan. Specimens from the Huachucas are similar to these Mexican specimens in external size, including measurements of the arm and hand, and most measurements of the skull. Adults from the Huachucas differ from the Mexican specimens in color as follows: more reddish cinnamon on the back directly behind the ears; underparts less sooty and a lighter gray; fur on chin lighter; throat more grayish. Even though specimens from the Huachucas, in southeastern Arizona, differ rather markedly in color from specimens from central Mexico, they are so similar in external and skull features that we have elected to regard them, for now, as the same form, *Choeronycteris mexicana*.

Measurements.—Four males (1 in brownish pelage, 1 brownish-gray, and 2 grayish) and 13 females (5 brownish, 4 brownish-gray, 4 grayish) give the following average, minimum, and maximum measurements: total length, 81.8(76–88), 81.3(75–89); tail, 10.5(10–12), 9.8(7–12); hind foot, 13.0(12–14), 12.8(11–14); ear from notch, 17.3(16–18), 17.1(15–19); forearm, 44.5(44.1–44.9), 45.0(42.7–46.4); third metacarpal, 42.7 (42.2–43.3), 42.9(41.1–44.5); fourth metacarpal, 39.9(39.4–40.7), 39.9 (37.6–41.5); fifth metacarpal, 38.8(37.6–39.7), 38.9(36.9–41.3); tibia, 15.9(15.4–16.5), 16.1(14.5–17.2); greatest length skull, 30.1(29.7–30.3), 29.8(28.8–30.2); condylobasal length, 29.0(28.6–29.1), 28.7(27.9–29.1); least interorbital width, 3.9(3.7–4.0), 3.8(3.7–4.0); palatal length, 18.1 (17.8–18.3), 18.1(17.1–18.5); mastoidal width, 9.4(9.2–9.6), 9.1(8.8–9.4); width of braincase, 9.7(9.6–9.9), 9.9(9.6–10.1); alveolar length upper premolar-molar series, 8.7(8.6–8.8), 8.6(8.0–8.9).

Remarks.—Long-tongued bats, *Choeronycteris mexicana*, were encountered in nearly every dark mine tunnel and cave. Only 2 were taken from buildings. The tunnels did not have to be especially deep to provide a suitable habitat. *Choeronycteris* were usually found inhabiting the same caves and tunnels as *Corynorhinus rafinesquii*, and even the same parts of the underground retreats. No *Choeronycteris* and *Leptonycteris* were ever found associated. As a matter of fact, no *Leptonycteris* were ever encountered in tunnels or caves.

Long-tongued bats were never numerous in their tunnel retreats. They were most numerous in a mine tunnel in Ash Canyon where we would estimate there were nearly 50 individuals, and in a tunnel of the Harper Mining Company, with an estimated 30. No long-tongued bats were ever shot flying outside at dusk, although we collected many other kinds of bats in this fashion.



FIG. 20. *Choeronycteris mexicana* from Ash Canyon, Huachuca Mountains. Notice that the tail in the interfemoral membrane does not extend as far posteriorly as the ankle. Photographed August, 1950, by W. W. Goodpaster.

Long-tongued bats readily became disturbed in mine tunnels and started to fly upon approach. Their exceedingly erratic flight, even in a small tunnel, made shooting them difficult. The bats frequently attempted to escape from the mine shaft, and although we tried to block their only exit with our bodies, they would occasionally escape before we could stop them. On such occasions they were not hesitant to fly out of dark tunnels into the bright sunlight.

Long-tongued bats were encountered in mines that were situated in a variety of habitats: at the lower edge of the tree (oak) zone, in the pine-oak woodland, and in the pine-fir belt.

Several of the specimens had yellow pollen on the fur around the face. Of the 41 specimens taken, 35 were females. At the 3 places where more than one specimen was taken, both females and males were found, but in the following ratios: Miller Canyon, 6 ♀♀, 1 ♂ Ash Canyon, 19:2; 11 mi. S of Fort, 9:2. It appears that some of these males are fully adult, and thus both adult males and females were together at this time of year. This is not true for *Leptonycteris* in August. None of the females had embryos and if some of the specimens were the young of that year, they had attained adult size and adult pelage, as near as we could determine.

Leptonycteris nivalis nivalis (Saussure)

LONG-NOSED BAT

M [= *Ischnoglossa*]. *nivalis* Saussure, Revue et Magasin de Zoologie, 12 (ser. 2):492, 1860. Near snow line on Mount Orizaba, Mexico.

Leptonycteris nivalis, Miller, Proc. Biol. Soc. Wash., 13:126, 1900.

Records of occurrence.—Mouth of Miller Canyon¹ (ranch barn), 56; Canelo Mine, 8 mi. W Fort, 6.

Comparisons.—Specimens from the Huachucas differ from *Leptonycteris nivalis nivalis* from eastern Mexico and the Chisos Mountains, Texas, in that the coloration of the back is more reddish brown than sooty brown, with the underparts washed with a brownish or cinnamon; the total length of the 3 phalanges of the third finger is less, rather than more, than the length of the metacarpal of the same finger; and the skull is shorter and the braincase narrower. A more complete analysis of this variation will be reported upon elsewhere.

Measurements.—Twenty-two females¹, fully adult as judged by the reddish brown color of the fur, give the following average, minimum, and maximum measurements: total length, 77.6(69-84); tail — (caudal vertebrae are present, but the tail is not readily measurable); hind foot, 15.0(13-17); ear from notch, 16.0(14-18); forearm (based on measurements from 10 specimens), 53.0(51.3-54.3); third metacarpal (10),

47.3(46.2-49.9); fourth metacarpal (10), 42.8(41.2-46.1); fifth metacarpal (10), 40.6(38.0-43.3); greatest length of skull (18), 26.7(25.7-27.3); condylobasal length, 25.7(25.1-26.4); interorbital width, 4.6(4.4-4.9); palatal length, 14.6(14.0-15.1); mastoidal width (for 20), 10.4(10.0-10.8); width of braincase (for 19), 9.9(9.6-10.2); alveolar length, upper premolar-molar series, 6.3(6.0-6.6). A single adult male, from the Panama Mine, gives the following corresponding measurements: externally, 78, 0, 16, 17; forearm and metacarpals, 52.2, 47.1, 42.8, 41.3; cranially, 27.3, 26.2, 4.6, 14.9, 10.6, 10.0, 6.5.

Remarks.—In August, 1950, approximately 100 long-nosed bats, *Leptonycteris nivalis*, occupied at night the barn at the lower edge of the oak belt in the mouth of Miller Canyon. This apparently was a nursery colony. Of the 55 skins saved, all of those judged to be adult (24, as determined by brown rather than grayish color) were females. Of the remaining 31, judged to be immature, 12 were males, 19 females. It is possible that some of the 19 females should be regarded as adults, and thus the ratio of immature males and females would more nearly approach 1 to 1.

The nursery colony was not detected in this infrequently used horse barn in 1949 and was almost overlooked in 1950. Daytime searches in 1950 revealed no bats, although the yellow splatterings of fecal material indicated that *Leptonycteris* frequented the barn. An evening visit revealed the presence of about 100 bats noisily flying about or hanging on the rafters. The bats were prone not to leave the barn, for they did not fly in any mass movement from the 12 open windows or from the opening under the eaves when we shot into the colony. One might suspect that this was a central meeting place within the feeding area for this colony. Even when we were not disturbing the colony, they were flying around. In any event, the barn did not provide a daytime roost. The adults possessed enlarged mammary glands, and some or all of the young may still have been nursing. However, the young were very nearly as large as the adults, could well maintain prolonged flight, and were capable of feeding themselves, judging by the presence of pollen around their noses.

In 1949, a few long-nosed bats were encountered in a mine west of the Fort (Canelo Mine). Most of them were taken near the entrance of the mine and in association with *Corynorhinus rafinesquii*. Only 1 of the 6 was taken far back in the mine, and here it was hanging near the outer edge of a cluster of approximately 300 *Myotis velifer*. The nursery colony in Miller Canyon never had other species of bats associated with it. The adults in the mine were of mixed sexes, for one adult male and one adult female were taken together with four young. Berry



FIG. 21-A. Dorsal view. *Leptonycteris nivalis* in Miller Canyon, Huachuca Mountains. Note short tail and interfemoral membrane. Photographed August, 1950, by W. W. Goodpaster.



FIG. 21-B. Lateral view, *Leptonycteris nivalis* in Miller Canyon, Huachuca Mountains. Note large nose-leaf. Photographed August, 1950, by W. W. Goodpaster.

Campbell (1934:242) observed a few *Leptonycteris* in this same mine and cave in 1933.

The presence of long-nosed bats in mines or buildings can readily be detected, in our experience, by the presence of their distinctive droppings, which are bright yellow and of a watery consistency. These droppings look much like splashings of yellow paint on a floor. This coloration must be correlated with the diet of these animals. Nearly every specimen collected had the head well covered with yellow pollen. This most likely came from Jimson weeds which have an abundance of yellow pollen, were numerous around the barn, and were open all night long. A short watch, at a suitable distance from the Jimson weeds by the barn, failed to reveal any bats feeding at these flowers. However, we suspect that they must feed there at some hours during the night. An analysis of the stomach contents of 6 bats by Richard Van Gelder revealed that an average of 92 per cent was pollen and 8 per cent insect remains.

Since these bats must feed rather heavily upon pollen and nectar, they probably have little use for some of their teeth. This is reflected in the variation in the incisiform teeth, particularly in the lower jaw. Since the tongue probably rubs over the top of these incisors when it is protruded, the absence of these teeth may be advantageous. Of 40 skulls examined for numbers of teeth, only 25 had the full complement of 4 lower incisors. Three had all 4 incisors absent, 2 had 3 incisors absent, 6 had 2 incisors absent, and 2 had 1 incisor absent. Of those 25 that had the complete set of lower incisors, there were all stages of reduction in size. Some had minute lower incisors visible only under considerable magnification. The majority that were lacking incisors were adult animals. We suspect that with increasing age the lower incisors are worn away or lost in some fashion and the alveoli are entirely covered over. Furthermore, this is an advantageous, "degenerative" loss as it enables the bat to protrude the tongue more easily and naturally increases the normal space or diastema which is present between the 2 right and 2 left lower incisors. Only one specimen in the 40 had lost upper incisors (3 teeth) and one had apparently broken off or lost an upper canine.

This species was parasitized by 2 species of streblid flies: *Trichobius sphaeronotus* Jobling and *Nycterophilus coxata* Ferris.

Myotis yumanensis yumanensis (H. Allen)

YUMA MYOTIS

Vesperilio yumanensis H. Allen, Monogr. Bats No. Amer., Smithsonian Misc. Coll., 165:58, 1864. Old Fort Yuma, Imperial Co., California.

Myotis yumanensis, Miller, No. Amer. Fauna, 13:66, 1897.

Records of occurrence.—“Huachuca Mountains,” 1 skull, in Chicago Natural History Museum, according to Miller and Allen (1928:67). This specimen cannot be located at that museum now.

Remarks.—Measurements are not available for the specimen listed by Miller and Allen in their revision of *Myotis* and no comment is made about this specimen.

***Myotis velifer velifer* (J. Allen)**

CAVE MYOTIS

Vesperotilio velifer J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:177,

1890. Santa Cruz del Valle, Guadalajara, Jalisco.

Myotis velifer, Miller, No. Amer. Fauna, 13:56, 1897.

Records of occurrence.—Canelo Cave, 8 mi. W Fort, 32¹; Carr Canyon Reef, 3; Ash Canyon, 1.

Comparisons.—Specimens from the Huachucas differ from *Myotis velifer incautus* in being much darker in color of pelage and smaller in size. Miller and Allen (1928:92) indicate that intergradation between *velifer* and *incautus* occurs in eastern Arizona and that the range of variation in tint among individuals from one locality may cover the entire range of color between the pale *incautus* and the dark *velifer*. Of the 36 specimens from the Huachucas, 2 are pale and approach the color of *M. v. incautus* from Kansas. The remainder are all dark and appear to be typical of *M. v. velifer*. In size, all of the specimens are nearest the latter subspecies.

Measurements.—Ten mature males¹ and 10 mature females¹ give the following average, minimum, and maximum measurements: total length, 93.8(89–100), 94.8(90–103); tail, 43.6(40–47), 43.3(38–48); hind foot, 10.9(10–11), 10.9(10–12); ear from notch, 15.8(13–18), 15.7(15–17); tibia, 17.1(16.2–17.7), 17.6(16.3–18.8); forearm, 41.8(39.4–42.9), 42.5(41.4–44.2); thumb, 6.3(5.5–7.1), 6.7(6.0–7.1); greatest length of skull, 15.8(15.2–16.5), 15.8(15.6–16.1); condylobasal length, 15.2(14.4–15.8), 15.4(15.2–15.6); zygomatic breadth, 10.1(9.8–10.4), 10.2(10.0–10.5); least interorbital constriction, 3.9(3.7–4.1), 3.9(3.8–4.1); width of braincase, 7.4(7.1–7.9), 7.3(7.2–7.5); crown length of maxillary tooth-row, 6.5(6.1–6.7), 6.5(6.2–6.6); maxillary breadth at M³, 6.7(6.5–6.9), 6.7(6.6–6.8).

Remarks.—Cave myotis were exceedingly abundant in the Canelo Cave, and we estimated that there may have been as many as 10,000 there in 1949. They did not seem to be as abundant in 1950. Bats were present near the entrance, in several crevices, but were especially abundant on the ceiling of a large cavernous room. Some 40 to 50 feet down on the floor of this room, bat guano appeared, in the beam from our

flashlight, to be at least a foot deep in places. The limestone conglomerate and chert of the ceiling made it possible for the bats to get a good footing overhead. In some places the bats were hanging in clumps of tens, in other places in clumps of hundreds. In this same cave, there were a few *Choeronycteris mexicana* and *Corynorhinus rafinesquii*, but these two species were much nearer the entrance of the cave than the *Myotis velifer*, and *M. velifer* seemed much less tolerant of light than many other species.

Cave myotis were taken from the ceiling of a mine tunnel on the Carr Canyon Reef in a semi-dormant condition in August, 1949. The individual taken from the mine tunnel in Ash Canyon at the same time was in the same condition.

Cave myotis were present, but not in great numbers, in an abandoned schoolhouse at Hereford. This building had been gassed (cyanide) only a short time before our visit and the *M. velifer* were the first to re-establish themselves in this attic. *M. velifer* may have been present in some of the abandoned buildings at Fort Huachuca, although repeated inquiries produced no indication of bats.

Cave myotis were found in mines, caves, and buildings opening out into a variety of ecological situations: in the pines and oaks (at Carr Reef), at the lower edge of the oaks (at Canelo Cave), and well out in the Lower Sonoran desert at the schoolhouse at Hereford.

Myotis evotis evotis (H. Allen)

LONG-EARED MYOTIS

Vesperilio evotis H. Allen, Monogr. Bats No. Amer., Smithsonian Misc. Coll., 165:48, 1864. Monterey, Monterey Co., California (see Dalquest, Proc. Biol. Soc. Wash., 56:1, 1943).

Myotis evotis, Miller, No. Amer. Fauna, 13:77, 1897.

Records of occurrence.—Miller Canyon, 1¹. Other record: "Huachuca Mountains," 1 skin (in Chicago Nat. Hist. Mus., according to Miller and Allen, 1928:117).

Comparisons.—Tips of dorsal hairs slightly more golden than some other Arizona specimens, but less golden than in specimens from the Graham Mountains, Arizona.

Measurements.—One adult male¹: total length, 94; tail, 41; hind foot, 9; ear from notch, 19; tibia, 17.5; forearm, 36.2; thumb, 6.7; greatest length of skull, 16.3; condylobasal length, 15.2; zygomatic breadth, 9.5; least interorbital constriction, 3.9; width of braincase, 7.5; crown length of maxillary toothrow, 6.2; maxillary breadth at M³, 6.0.

Remarks.—The only specimen of long-eared myotis was taken in association with *Myotis volans* around a water tank at dusk. This was in a small clearing just inside the oak belt at the Broken Arrow Ranch. Many

specimens of the nearly as long-eared *Myotis thysanodes* were taken in the Huachucas, but none of these was taken in Miller Canyon.

In the field, when we shot the long-eared bat, we immediately recognized it as a *Myotis evotis*, but after the ears became dry and somewhat shrunken, we found it somewhat difficult to distinguish between *M. evotis* and *M. thysanodes*.

In 1894, W. W. Price records (Allen, 1895:249) that "Mr. Miller obtained a single male from the thick branches of an oak in the Huachuca Mountains. . . ."

***Myotis thysanodes thysanodes* Miller**

FRINGE-TAILED MYOTIS

Myotis thysanodes Miller, No. Amer. Fauna, 13:80, 1897. Old Fort Tejon, Kern Co., California.

Records of occurrence.—Carr Canyon Reef, 24; mouth of Carr Canyon, 4; Caneo Mine, 17; Sunnyside, 2; mine shaft, Copper Canyon, 2 (Chicago Nat. Hist. Mus.).

Comparisons.—Our specimens seem similar to other specimens of this subspecies from Arizona. However, there is a wide range of variation, in several features, in our series. Coloration of the dorsal fur varies from a pale Ochraceous-Buff through a bright Ochraceous-Orange to near Dresden Brown (capitalized terms of color used in this study are taken from Ridgway, 1912). In some specimens the ears are dark, in others, light and translucent. The length of forearm varies from 39.4 to 45.0 mm., length of ear (from notch), from 17 to 22 mm. There appears to be no consistent correlation between longer ears, longer forearms, or color of ears, or any combination of variables.

Measurements.—Of 10 males and 10 females, all judged to be adult, average, minimum, and maximum measurements are, respectively: total length, 89.1(80-98), 91.3(85-97); tail, 38.5(33-42), 39.9(36-44); hind foot, 10.5(9-12), 10.7(10-11); ear from notch, 18.3(18-19), 19.3⁸(18-21); tragus, 11.3(10-13), 12.1(10-14); forearm, 41.0(39.3-42.1), 42.5 (40.3-43.9); thumb, 5.7(5.0-6.4), 5.9(5.4-6.5); greatest length of skull, 16.7(16.3-17.0), 17.0(16.3-17.4); condylobasal length, 15.4(15.2-15.7), 15.8(15.2-16.3); zygomatic breadth, 10.2⁸(9.9-10.6), 10.4⁹(10.0-10.6); least interorbital constriction, 4.1(3.9-4.3), 4.1(3.8-4.4); width of brain-case, 7.7(7.5-7.9), 7.8(7.5-8.3); crown length of maxillary toothrow, 6.4 (6.3-6.5), 6.4(6.2-6.6); maxillary breadth at M^3 , 6.6(6.3-6.7), 6.6(6.3-6.7).

Remarks.—In mid-August, 18 semi-dormant fringe-tailed myotis were found hanging together in a single clump, in a mine tunnel on Carr Canyon Reef. All of the specimens were males. At about this same time,



FIG. 22. Fringe-tailed myotis, *Myotis thysanodes thysanodes*, on side of mine tunnel in Carr Canyon, Huachuca Mountains. Photographed August, 1950, by W. W. Goodpaster.

in the Canelo Mine, 14 of 16 specimens collected were females. The 2 males apparently were young of the year, for the epiphyses of the long bones were not fused. Probably Canelo Mine served as the site for a nursery colony of *Myotis thysanodes*, with only adult females and young of the year of both sexes present. At Canelo Mine, *Myotis thysanodes* were found in association with many *Myotis velifer*, and of the 2 species, there were several thousand individuals in the mine. Apparently none of the nearly full-grown yearling males joined the bachelor colony, for none of the males from Carr Canyon Reef is a young of the year.

Myotis thysanodes is more colonial or gregarious than *Myotis evotis*

and any other *Myotis* in the Huachucas except *Myotis velifer*. When the *M. thysanodes* became fully aroused, they clambered around on the sides and ceiling of a mine tunnel with rapidity and dexterity. We had difficulty in photographing individuals of this species because of their ability to move around so rapidly without flying.

Most of the *Myotis thysanodes* were taken farther up in the oak woodland than the one *Myotis evotis*. Those in Carr Canyon from near the canyon's mouth were taken in an oak-walnut-sycamore association. Those taken on the Reef were near the lower edge of the pine belt. At Sunnyside they were feeding over a pond among oaks but adjacent to chaparral. At the Canelo Mine, they occurred at the lower edge of the oak belt.

***Myotis volans interior* Miller**

HAIRY-WINGED MYOTIS

Myotis longicrus interior Miller, Proc. Biol. Soc. Wash., 27:211, 1914.

Twining, Taos Co., New Mexico.

Myotis volans interior, Miller and Allen, Bull. U.S. Nat. Mus., 144: 142, 1928.

Records of occurrence.—Mouth of Miller Canyon, 4¹; Garden Canyon, 2²; Carr Canyon Reef, 1³.

Comparisons.—Our specimens are much darker than the Ochraceous-Buff to Ochraceous-Tawny of *M. v. interior*, and do not possess the dark reddish color of *M. v. amotus*. To us, our specimens appear to be young (the teeth show no signs of wear), and we suspect that there may be a distinctive, darker pelage in these juveniles. If this is not the case, our specimens appear to differ rather markedly from named forms of *M. volans*.

Measurements.—Four males^{1, 2, 3} and 3 females^{1, 2} are: total length, 91, 100, 99, 97, 92, 98, 93; tail, 46, 46, 46, 46, 45, 45, 46; hind foot, 10, 9, 8, 9, 9, 8, 8; ear from notch, 15, 11, 12, 13, 14, 11, 12; forearm, 37.8, 39.0, 38.6, 37.9, 38.3, 39.3, 38.3; thumb, 5.0, 5.6, 5.4, 5.1, 4.5, 5.5, 5.5; greatest length of skull, 13.8, 14.4, —, 14.1, 14.7, 14.3, 14.1; condylobasal length, 13.3, 14.1, —, 13.6, 13.8, 13.5, 13.5; zygomatic breadth, 8.7, 8.8, 8.7, 8.9, 8.9, —, —; interorbital constriction, 4.0, 4.1, 4.0, 4.1, 4.3, 3.9, 4.0; breadth of braincase, 7.2, 7.4, —, 7.2, 7.4, 7.2, 7.0; crown length of maxillary toothrow, 5.0, 5.3, 5.2, 5.3, 5.2, 5.2, 5.2; maxillary breadth at M³, 5.6, 5.8, 5.6, 5.7, 5.9, 5.5, 5.7.

Remarks.—Hairy-winged myotis were flying with *Myotis subulatus* among the tops of the oaks at early dusk in the mouth of Garden Canyon and with *Myotis evotis* and *M. subulatus* among the oaks in the mouth of Miller Canyon in mid-August. The specimen taken on Carr Canyon Reef was hanging in the tungsten mine of Louis Seeman.

Myotis californicus californicus (Audubon and Bachman)**CALIFORNIA MYOTIS**

Vespertilio californicus Audubon and Bachman, Jour. Acad. Nat. Sci. Phila., 8(ser. 1, pt. 2):285, 1842. "California," and further restricted to Monterey, Monterey Co., California.

Myotis californicus, Miller, No. Amer. Fauna, 13:69, 1897.

Records of occurrence.—“Huachuca Mountains,” 1 skin, Chicago Nat. Hist. Mus.

Measurements.—Total length, 76; tail, 37; hind foot, 5.

Remarks.—This specimen, a skin only, is referable to the subspecies *M. c. californicus* and not to the pale desert form *M. c. stephensi* Dalquest (= *M. c. pallidus* Stephens). According to the information on the label, the specimen was collected at 5280 feet elevation on October 22, 1907, by H. S. Swarth.

Myotis subulatus melanorhinus (Merriam)**SMALL-FOOTED MYOTIS**

Vespertilio melanorhinus Merriam, No. Amer. Fauna, 3:46, 1890. Little Spring, north base San Francisco Mountain, Coconino Co., Arizona.

Myotis subulatus melanorhinus, Miller and Allen, Bull. U.S. Nat. Mus., 144:169, 1928.

Records of occurrence.—Mouth of Brown Canyon, 2¹; mouth of Garden Canyon, 1²; mouth of Miller Canyon, 1³; west slope, 12 mi. S Fort, 1⁴.

Comparisons.—The dorsal coloration of our specimens is near a Pinkish Cinnamon and all compare closely with specimens from Nevada and elsewhere in Arizona.

Measurements.—Four males^{1, 3, 4} and 1 female²: total length, 82, 81, 83, 81, 93; tail, 42, 43, 41, 39, 43; hind foot, 9, 9, 8, 8, 8; ear from notch, 16, 15, 17, 13, 15.5; forearm, 32.3, 32.3, 33.5, 33.0, 34.2; thumb, 4.7, 4.6, 5.1, 4.9, 4.4; greatest length of skull, 14.3, —, 14.6, 14.1, 14.9; condylobasal length, 13.4, —, 13.6, 13.2, 14.1; zygomatic breadth, 8.2, 8.5, 8.9, —, 9.1; interorbital constriction, 3.2, 3.2, 3.3, 3.4, 3.3; breadth of braincase, 6.5, —, 6.6, 6.9, 6.6; crown length of maxillary toothrow, 5.3, 5.4, 5.4, 5.2, 5.7; maxillary breadth at M³, 5.2, 5.4, 5.3, 5.5, 5.5.

Remarks.—Small-footed myotis were found in the oaks or at the lower edge of the oak belt. We suspect that they may start to fly and feed later than some other myotis. This species was abundant over a pond in Brown Canyon, but its erratic flight made it difficult to shoot. On the west side of the Mountains, several specimens were seen late at night in the beam of the headlights of the car as we searched for jack rabbits. One bat was taken.

Pipistrellus hesperus maximus Hatfield

WESTERN PIPISTREL

Pipistrellus hesperus maximus Hatfield, Jour. Mamm., 17:261, 1936.
Dog Spring, Grant Co., New Mexico.

Records of occurrence.—Mouth of Miller Canyon, 14¹; mouth of Brown Canyon, 1; mouth of Garden Canyon, 1; mouth of Carr Canyon, 1.

Comparisons.—In revising the western pipistrels, Hatfield (1936:260) referred specimens from Cochise County, Arizona, to *Pipistrellus hesperus australis*. Burt (1938:25) took exception to allocating pipistrels from Sonora (and this should include the Huachucas) to *australis*, but rather he (1933:115) would regard them as *merriami* since "southern Arizona and northeastern Sonora specimens average slightly larger than California specimens of *merriami*, but the extreme measurements are about the same and the slight average difference loses its value." Our specimens from the Huachucas do not seem referable to *australis*. They are larger than *australis*, and in this respect show approach to both *merriami* to the west and *maximus* to the east. In color, specimens from the Huachucas average lighter than *merriami* and more nearly resemble *maximus* and *hesperus*. Variation in color, however, in the series of 14 from Miller Canyon, taken August 18 to 23, is considerable. One specimen is as pale as any *hesperus*, another as dark as most *merriami*; the "average color" seems paler than in *merriami*. The large size of the specimens, especially of the forearm, is much as in *maximus*. Thus, on the basis of size and color, our specimens seem slightly nearer *P. h. maximus*. When someone restudies this group and analyzes the clinal variation, our specimens may prove referable to another subspecies.

The large size of specimens from Providencia mines, Sonora, 92 miles south of the Huachucas, indicates that these specimens may also be referable to *maximus*. If this should prove to be the case, specimens from southern New Mexico, western Texas, southeastern Arizona, and northern Mexico would bear the name *Pipistrellus hesperus apus* Elliot (1904) and not *P. h. maximus* Hatfield (1936).

Measurements.—Eight males¹, 6 females¹ give the following average and extreme measurements: total length, 70.9(68-75), 75.7(74-77); tail, 31.1(29-33), 32.8(32-34); hind foot, 7(7-7), 7(7-7); ear from notch, 13.4(13-15), 13.7(13-14); tibia, 12.1(11.7-12.3), 12.1(10.9-13.2); forearm, 30.0(29.0-31.6), 30.6(28.7-32.6); greatest length skull, 11.5(11.0-12.1), 12.2(12.0-12.4); width of braincase, 6.2(5.9-7.8), 6.0(5.9-6.1).

Remarks.—Western pipistrels are most often found flying over the alluvial fans and flats at the edge of or below the tree zone. For example, they were flying over a swimming pool at the lower edge of the oak belt in Miller Canyon, and just inside the oak belt in Garden and

Carr canyons. In Brown and Ramsey canyons, they were flying over water tanks out on the alluvial fans. This species was sometimes found associated with *Myotis volans* and *Myotis subulatus*. Pipistrels were never encountered in mine shafts and were among the first, if not the very first, bats to fly in the evening.

In August, 1949, there was enough water available in Miller Canyon to fill a swimming pool at the Broken Arrow Ranch. At dusk, pipistrels would fly in goodly numbers around the pool. After some shooting, the bats would disperse, and could be seen foraging for food just beyond, around mesquites and surrounding oaks.

***Eptesicus fuscus pallidus* Young**

BIG BROWN BAT

Eptesicus pallidus Young, Proc. Acad. Nat. Sci. Phila., p. 408, 1908.

Boulder, Boulder Co., Colorado.

Eptesicus fuscus pallidus, Miller, Bull. U.S. Nat. Mus., 79:62, 1912.

Records of occurrence.—Sylvania Ranch, 1¹; D'Albini's Ranch, 2²; mouth of Miller Canyon, 2³.

Comparisons.—Three of the specimens are a light, bright brown, near Saccardo's Umber, and are typical *E. f. pallidus*. Two specimens (one from D'Albini's, one from Sylvania) are much darker brown, and as in *E. f. bernardinus*. However, the underparts of these 2 are not as brownish as in most specimens of *bernardinus*, and all of our specimens are regarded as *pallidus*. However, the difference between the 2 dark and 3 light specimens is so noticeable that we readily detected this difference when we were collecting them in the field.

Measurements.—Three males^{1, 3} and 2 females² give the following measurements: total length, 109, 114, 105, 125, 118; tail, 51, 45, 40, 49, 52; hind foot, 12, 11, 11, 11, 9; ear from notch, 17, 14, 16, 18, 15; forearm, 48.2, 45.7, 41.8, 46.8, 47.5; thumb, 7.0, 6.2, 6.1, 6.2, 6.7; greatest length of skull, —, 19.4, 18.1, 19.8, 19.3; condylobasal length, —, 17.8, 17.3, 18.5, 18.1; zygomatic breadth, 12.2, 12.5, 12.0, 12.6, 12.2; interorbital constriction, —, 4.2, 4.2, 4.1, 3.9; breadth of braincase, —, 8.5, 8.4, 8.3, 8.2; maxillary toothrow, 6.9, 6.9, 6.8, 7.3, 6.9; maxillary breadth at M³, —, 7.8, 7.4, 8.1, 7.7.

Remarks.—Big brown bats were never encountered in caves or mine tunnels in summer, although we searched several thousands of feet of such tunneling. All of the specimens we obtained were shot at late dusk near a water source. At Miller Canyon the bats were flying over a small tank used for storing drinking water. At Sylvania the bat was flying over a spring-fed pond. At D'Albini's big brown bats were most numerous, although only 2 were taken. Here the bats were not flying over water,

but several tanks were near by. All of the situations where *Eptesicus* were encountered were at the lower edge of the oaks.

Lasiurus cinereus cinereus (Beauvois)

HOARY BAT

Vespertilio cinereus (misspelled *linereus*) Beauvois, Catal. Raisonné

Mus. Peale, Phila., p. 18, 1796. Philadelphia, Pennsylvania.

Lasiurus cinereus, H. Allen, Monogr. No. Amer. Bats, Smithsonian
Misc. Coll., 7:12, 1864.

Records of occurrence.—Sylvania Ranch, 1.

Comparisons.—Differs from specimens from Kansas and Illinois only in being slightly more yellow on top of head and back of neck.

Measurements.—Adult male: total length, 132; tail, 59; hind foot, 13; ear from notch, 17; tragus, 11; forearm, 51.1; thumb, 9.1; maxillary toothrow, 5.8. It was not possible to take other cranial measurements.

Remarks.—Our one specimen was collected over the pond at Sylvania or Peterson's Ranch at dusk. It was one of the first bats seen flying there. Shortly after the hoary bat was collected, big brown bats arrived over the pond.

In May, 1893, Price (in Allen, 1895:247) discovered a specimen dead on a fence in Miller Canyon. This species must be rare in the Huachucas.

Lasiurus borealis teliotis (H. Allen)

RED BAT

Atalapha teliotis H. Allen, Proc. Amer. Philos. Soc., 29:5, 1891. Type
locality unknown, but probably southern California.

Lasiurus borealis teliotis, Miller, No. Amer. Fauna, 13:110, 1897.

Records of occurrence.—Carr Canyon¹ (near mouth of Canyon at Healy's Ranch), 1; "Huachuca Mts." 1 (Chicago Nat. Hist. Mus.).

Comparisons.—The specimen from Carr Canyon appears more yellowish and the interfemoral membrane less heavily haired than some other specimens of *L. b. teliotis*.

Measurements.—Adult female¹: total length, 109; tail, 54; hind foot, 10; ear from notch, 13; tragus, 8; forearm, 40.6; thumb, 6.4; greatest length of skull, 13.2; condylobasal length, 12.2; zygomatic breadth, 9.2; interorbital constriction, 4.5; breadth of braincase, 7.5; maxillary toothrow, 4.5; maxillary breadth at M^3 , 5.9.

Remarks.—Our one specimen was caught late in the evening when it was quite dark, in a net placed over the pond at the Healy Ranch, in an association of oaks, sycamores, and walnuts. This is the only red bat we saw.

Corynorhinus rafinesquii pallescens Miller

LONG-EARED BAT

Corynorhinus macrotis pallescens Miller, No. Amer. Fauna, 13:52, 1897. Keams Canyon, Navajo Co., Arizona.

Corynorhinus rafinesquii pallescens, Miller, Bull. U.S. Nat. Mus., 128: 82, 1924.

Records of occurrence.—West slope, 11 mi. S Fort, 7¹; Carr Canyon Reef, 4; mouth Carr Canyon, 1; Miller Canyon, 1; Ash Canyon, 2; Sylvania Ranch, 1; Canelo Cave, 4; Fort Huachuca, 2 (U.S. Nat. Mus.).

Comparisons.—Specimens from the Huachucas are Drab in dorsal coloration and are darker—more smoky or sooty—than *C. r. pallescens*, and in this respect show approach to *C. r. mexicanus*. However, the tips of the hairs of most specimens are a bright brown, and in this feature are nearer *pallescens*. The coloration of the underparts is nearly intermediate between *pallescens* and *mexicanus*, but the amount of buffiness indicates that the specimens are slightly closer to *pallescens*. The skull is slightly larger in nearly all features, including length of toothrow, than the average for *mexicanus*, and in this respect the specimens are nearer to *pallescens*. The Huachucan specimens are intergrades between *pallescens* and *mexicanus*, but are slightly nearer to *pallescens* and are referred to that subspecies.

Measurements.—Fifteen males (from various localities) and 4 females¹ yield the following average, minimum, and maximum measurements: total length, 94.3(82–103), 98.8(93–103); tail, 45.7(37–52), 51.3(51–52); hind foot, 10.5(9–12), 10.8(10–11); ear from notch, 33.9(29–36), 34.5(32–36); forearm, 41.3(40.1–43.8), 43.0(41.4–43.8); thumb, 5.8(5.0–7.0), 5.8(5.6–6.1); greatest length of skull, 16.2¹¹(15.7–16.9), 16.3(16.1–16.5); condylobasal length, 14.7¹¹(14.4–15.1), 14.9(14.8–15.0); zygomatic breadth, 8.5¹¹(8.1–8.8), 8.5(8.3–8.7); interorbital constriction, 3.5¹²(3.4–3.6), 3.6(3.5–3.6); breadth of braincase, 7.6¹¹(7.3–7.8), 7.7(7.5–7.9); maxillary toothrow, 5.0¹⁴(4.8–5.2), 5.1(5.0–5.2); maxillary breadth at M³, 5.9¹³(5.6–6.1), 6.0(6.0).

Remarks.—Long-eared bats were encountered, along with long-tongued bats, *Choeronycteris*, in nearly every mine tunnel explored. The long-eared bats were difficult to approach and readily took flight. Frequently the long-eared bats were near the entrances or openings of caves or mines, but when disturbed would fly farther back into the tunnel. Because of this habit, one could concentrate the bats at the back end of the tunnel, provided there was no rear passageway or escape exit.

Male long-eared bats, and only males, were taken at all of the localities except at the mine tunnels of the Harper Company, 11 miles south of Fort Huachuca. Here, 4 adult females and one juvenile male were

taken. This probably was a nursery colony of long-eared bats, consisting only of adult females and young of the year of both sexes.

Antrozous pallidus pallidus (LeConte)

PALLID BAT

V[espertilio]. pallidus LeConte, Proc. Acad. Nat. Sci. Phila., 7:437,

1856. El Paso, El Paso Co., Texas.

Antrozous pallidus, H. Allen, Smithsonian Misc. Coll., 7:68, 1864.

Records of occurrence.—Probably along the eastern base of the Huachucas (see *Remarks*).

Remarks.—The presence of many pallid bats at Hereford, about 9 miles east of the base of the Huachucas, strongly suggests that they must occasionally reach the alluvial fans of these Mountains. We searched an abandoned schoolhouse in Hereford which was heavily infested with bats, but which had been gassed shortly before our visit. On the schoolroom floor we found 2 mummified *Antrozous pallidus pallidus* from which we recovered the skulls. A few live bats, of the species *Myotis velifer*, had re-invaded the gassed attic of the school.

There is a good possibility that *Antrozous* occurs at times in the many abandoned buildings at the Fort, although we heard no reports of bats there.

Tadarida femorosacca (Merriam)

POCKETED FREE-TAILED BAT

Nyctinomus femorosaccus Merriam, No. Amer. Fauna, 2:23, 1899.

Agua Caliente, Sonoma Co., California.

Tadarida femorosacca, Miller, Bull. U.S. Nat. Mus., 128:86, 1924.

Records of occurrence.—Fort Huachuca, 1 (not examined, in U.S. Nat. Mus., see Shamel, 1931:13).

Measurements.—Shamel's measurements (1931:22) for this specimen, a female, 36038/20922, U.S. Nat. Mus., are: head and body length, 54.4; tibia, 13.4; foot, 8.5; forearm, 46.6; third metacarpal, 45.2; fifth metacarpal, 25.8; thumb, 6.4; ear from meatus, 18.6; ear from crown, 11.8; skull length, 19.2; zygomatic breadth, 9.6; interorbital breadth, 3.8; occipital depth, 6.0; braincase breadth, 8.8; basal length, 16.2; maxillary toothrow, 7.2.

Remarks.—A specimen of the pocketed free-tailed bat is recorded by Shamel (*ibid.*) as from Fort Huachuca, without further comment. We can add nothing to this record.

A specimen of *Nyctinomus brasiliensis* [= *Tadarida mexicana*] is recorded by Allen (1895:246), and Price says the "specimen was caught

in a damp tunnel in the Huachuca Mountains. . . ." This specimen is now in the Chicago Natural History Museum, and Colin C. Sanborn informs us that this specimen (1066) is *Myotis velifer velifer*. The Mexican free-tailed bat, *Tadarida mexicana*, is thus not recorded from the Huachucas, nor was it taken by us, but we suspect that the several hundred abandoned buildings at the Fort may provide refuge for free-tailed bats at some, if not at all, times.

Ursus americanus amblyceps Baird

BLACK BEAR, "BROWN" BEAR

Ursus amblyceps Baird, Rep. U.S. and Mex. Bound. Surv., 2(2):29, 1859. Fort Webster (copper mines), on the Gila River, Grant Co., New Mexico.

Ursus americanus amblyceps, Bailey, No. Amer. Fauna, 25:187, 1905.

Records of occurrence.—See *Remarks*.

Remarks.—At no time has the black bear, known to the inhabitants of the Huachucas as the "brown" bear, been common in the Mountains. Before it was declared a predatory animal in the 1940's, it was more plentiful because then it was not specifically hunted. By 1950, when the bear had been restored to the status of "protected," it was nearly exterminated.

In the early 1930's, Henry Van Horn encountered a brown bear at the upper end of Bear Canyon (near the Wakefield Mine, see Fig. 16). The bear was being run by dogs from a nearby hunting party and it took to a tree near Van Horn. When the bear was unable to maintain a good footing in the small tree, it hastened down and continued down the canyon and out of sight. Carl Joerger had also seen several brown bears between 1910 and 1950 in Bear Canyon, and some of the other smaller adjacent canyons. He recalled having seen one female with cubs. Earl Long found sign of a bear in Sheelite Canyon during the winter of 1949-50. Sign of bear was noted in Huachuca, McClure, and Sheelite canyons about 1950 by Charles Wallmo and Steve Gallizioli. The latter trailed a bear down Huachuca Canyon nearly to the residential area of the Fort. D'Albini had not seen a bear at the southern end of the Mountains for several years. In 1892, A. K. Fisher "saw fresh diggings about the old logs near the streams [in Box Canyon], which evidently were made by these animals."

The bears sometime partially or completely girdle fir trees to obtain either the sap or the insects that accumulate in the scars, according to Earl Long. This "barking of trees" could be easily confused with the work of porcupines, according to Long. The bear in Sheelite Canyon was feeding on fawn, but this may have been as carrion.

Procyon lotor mexicanus Baird

RACCOON

Procyon hernandezii, var. *mexicana* Baird, Mamm. No. Amer., p. 215, 1857. Espia, northwestern Chihuahua, Mexico.

Procyon lotor mexicanus, Mearns, Proc. Biol. Soc. Wash., 27:65, 1914.

Records of occurrence.—Fort Huachuca, 1 (Goldman, No. Amer. Fauna, 60:53, 1950).

Remarks.—At the present time, raccoons rarely get into the wooded portions of the Huachucas, or even onto the alluvial fans on the east side of the Mountains. They tend to remain on the flats and along the San Pedro River. One was seen dead on the highway about 5 miles southeast of Hereford, and not far from the San Pedro, and all reports given us were to look for coons along the river. Charles Wallmo saw a raccoon in the oak woodland along Highway 92 about one mile south of Miller Canyon early in 1951. On the southwest side of the Huachucas, raccoons are reportedly "fairly common in the lower woods."

At an earlier time, raccoons must have been more numerous in the Mountains, for Price writes in 1894 (Allen, 1895:250): "The tracks of a few [raccoons] were seen along the streams at the base of the Huachuca Mountains. . . ." A. K. Fisher writes (in 1892) that raccoon were "seen along the trail above the Post. . . ." With the recent immigration of coatis (*Nasua*) into the mountainous portion of the Huachucas, one cannot help wondering if the coatis are now occupying part of a niche formerly occupied by the raccoon, and forcing the raccoon farther out from the Mountains. In the Canelo Hills just to the northwest of the Huachucas, raccoons and coatis occur together in good numbers, according to Charles Wallmo.

Nasua narica molaris Merriam

COATI-MUNDI, CHULA

Nasua narica molaris Merriam, Proc. Biol. Soc. Wash., 15:68, 1902.
Manzanillo, Colima, Mexico.

Records of occurrence.—Miller Canyon, 2¹; Carr Canyon, 1²; Huachuca Canyon, 3 (skulls only); head of Garden Canyon, 1 (skull only); Sawmill Canyon, 6300 ft., 3 (skulls only); Split Rock, Huachuca Mts., 1 (skin only), U.S. Nat. Mus.

Comparisons.—We have followed Hershkovitz (1951:560) in regarding the coatis of northern Mexico and southwestern United States as of a single subspecies, and the earliest available name is Merriam's *Nasua narica molaris*. We can discern no important differences in color or skull between *N. n. molaris* and *N. n. pallida* Allen, and we regard the latter as synonymous with *molaris*.

Measurements.—Three adult females^{1, 2} are as follows: total, 1041, 1067, 946; tail, 540, 495, 445; hind foot, 95, 102, 102; ear, 38, 35, 38 (all external measurements are converted from inches); greatest length skull, 120.5, 124, 121.5; condylobasal length, 116.5, 119.5, 118; zygomatic breadth, 66.8, 66.3, 62.0; height of cranium from palatal shelf to median point over postorbital processes, 39.3, 37.8, 35.7; least interorbital breadth, 30.2, 28.7, 28.1; mastoidal breadth, 47.5, 47.5, 46.7; breadth across postorbital processes, 37.7, 37.7, 36.0; palatilar length, 72.0, 74.4, 72.9; alveolar length maxillary toothrow, 45.0, 46.6, 46.7; crown length upper carnassial, 7.3, 7.3, 7.6.

Remarks.—Coati-mundis, or chulas, as they are locally known, are regarded by many residents as having been in the Huachucas for a relatively short time. This seems to be a mistaken impression, for as early as 1892, A. K. Fisher writes of their presence. Fisher (1892) says, "Split rock, which is within a short distance and in plain sight of the Post, is the locality where Private Leopold Hengg of B troop 2nd Cavalry captured a Nasua and saw another. Lieut. Winn sent the skin to the National Museum." This skin bears no. 19506 in that museum. Marshall F. Ashburn told Charles Wallmo he obtained a pet coati from the nearby Patagonias about 1914, and he was not aware that they were rare there at that time. Stanley Young informs us that he saw tracks of this animal near Sunnyside between 1917-18. For some reason, many persons believe that coatis were not present in the Huachucas before 1924. It was in February of that year that John Merritt obtained a specimen of this animal, previously unfamiliar to him, which was sent to the University of Arizona and the U.S. Biological Survey for identification. About 1924, the coati began to become increasingly evident in the Huachucas. By 1949-50, packs of as many as 25 or more were seen together and coatis were reported from every canyon of the Huachucas.

During the winter months, coatis are not seen far up in the Mountains, and some of the local residents feel they remain well down in the canyon bottoms during that time. They are most frequently encountered in the damp canyons where oaks predominate, or where oaks and pines are abundant.

Two females taken by us in Miller Canyon in August, 1949, had been feeding on grasshoppers, white grubs (about 1½ inches in length), and cactus fruit (probably of the prickly pear). There are reports that occasionally coatis prey upon poultry and that they damage fruit crops. Five specimens taken in August and September, 1950, had only juniper berries in their stomachs, according to Charles Wallmo. These animals are exceptionally good diggers as Goodpaster had an opportunity to witness. An animal caught in a trap in Carr Canyon jumped up and down as it was approached, switching its long tail from side to side.

Soon it started digging with its front feet, and stones and dirt flew in every direction in spite of the fact that a steel trap was on one hind foot. In about 5 minutes, a hole almost large enough to accommodate the body had been dug. Stones that must have been 6 inches in diameter were completely unearthed and moved in the digging operation.

Sometimes the coatis are in small groups of 2 or 3, or again in larger packs. In 1950, during August, 2 coatis were seen briefly in Miller Canyon although their presence was known from diggings along the heavily wooded (pine and oak) parts of the canyon. In August of 1949, a pack estimated at 50 individuals was seen near the same spot in Miller Canyon. About two-thirds of this pack were made up of half-grown young and the adult females were lactating. Attention was directed to this group along the canyon wall as they loosened rocks which came tumbling down. When the group became excited, the animals scurried with ease over rocks and ledges, between and through small trees and bushes.

The 3 skulls from Sawmill Canyon were picked up from around an old poison station. Two of these coatis were very young; the premolars were unworn and the molar unerupted.

Bassariscus astutus arizonensis Goldman

RING-TAILED CAT

Bassariscus astutus arizonensis Goldman, Proc. Biol. Soc. Wash., 45: 87, 1932. Cosper Ranch, Blue River, 5000 ft., about 12 mi. S Blue, Greenlee Co., Arizona.

Records of occurrence.—See *Remarks*.

Measurements.—An adult male from "Huachuca Mountains," as recorded by Allen (1895:252): total length, 720; tail, 345; hind foot, 68; ear, 50.

Remarks.—Ring-tailed cats occur throughout the Mountains in relatively few numbers on the rocky slopes. Local residents reported their presence in Ash, Montezuma, Carr, Ramsey, and Bear canyons, and around Sutherland Peak. On Carr Reef, a house cat cornered a ringtail which Louis Seeman caught and tried to tame. When it killed some chickens, he shot it. A ringtail entered the cabin of Charles Morgan in Ash Canyon, apparently driven there by his cats. At least 3 ringtails were killed during the winter of 1949-50 in Ramsey Canyon. One of these was reportedly found in a chicken coop. On one occasion, a ringtail entered a trap set in the Mountains for lion, according to Earl Long. In 1894, Price found the species "rare in the Huachucas, though a few are killed every year by the miners and wood choppers" (Allen, 1895:252).

The ring-tailed cats of the Huachucas are referred, on a geographic basis, to the subspecies *arizonensis* as described by Goldman from east-

central Arizona. Specimens are needed to ascertain if the Huachuca animals are of small size and dark color, as is characteristic of *B. a. arizonensis*.

Spilogale putorius ambigua Mearns

SPOTTED SKUNK

Spilogale ambigua Mearns, Proc. U.S. Nat. Mus., 20:460, 1897.
Eagle Mountain, 16 mi. E Las Palomas, Chihuahua, Mexico.

Records of occurrence.—Miller Canyon, 13¹(1, a skull only). Additional records: "Huachuca Mts., 3(Chicago Nat. Hist. Mus.); Fort Huachuca, 3(U.S. Nat. Mus., see Howell, 1906:30, listed under *S. arizonae*); "Huachuca Mountains," 3(U.S. Nat. Mus., see Howell, 1906:25, listed under *S. ambigua*).

Comparisons.—Spotted skunks in the Huachucas were referred to 2 full species, *Spilogale ambigua* and *Spilogale arizonae*, when the genus was revised by Howell (1906). *S. arizonae* Mearns (1891, Fort Verde, Yavapai Co., Arizona) differs from *S. ambigua* Mearns (1897, Eagle Mountain, Chihuahua, Mexico) only in a broader, flatter, rather than arched, braincase, according to Howell (1906). The dome-shaped braincase of *ambigua* and slant-sided braincase of *arizonae* are well portrayed in Howell's photographs of the posterior aspect of the skulls (1906:pl. 8). In the 9 adult skulls of males from the Huachucas, 3 have the braincase highly arched (dome-shaped) as in *ambigua*; 4 are flat (slant-sided) as in *arizonae*; 2 seem to be intermediate. In the slant-sided skulls, the skulls are consistently broader across the zygomatic arches and the mastoidal bullae are more greatly inflated. This is particularly noticeable when the skull is viewed from above; the sagittal crest is higher and more prominent, and the skull is broader through the interorbital region. Thus, there are at least 4 cranial features separating "arizonae-like" skulls from "ambigua-like" skulls. There are no significant or constant differences in color pattern or external size correlated with these cranial differences.

This variation in vaulting of the braincase, and correlated differences in size of the skull, may be entirely due to slight differences in ages in the two groups of skulls. In the *ambigua*-like skulls, the upper Pm^4 is worn on the inner basin but the lateral, protoconal ridge is unworn; in upper M^1 , there is a slight trace of the cusps and the tooth has not been worn smooth. In the *arizonae*-like skulls, the lateral protoconal ridge in Pm^4 is much worn; M^1 is without indication of any cusps and the tooth is much worn. The two skulls that are intermediate between the 2 types are rather intermediate in tooth wear. It very well may be that with increasing age, from the *ambigua* type to the *arizonae* type, the skull takes

on a more mature, flatter, less-arched appearance. In young skunks, the skull is very much arched. Also with increasing age, as might be expected, the skull becomes narrower interorbitally, the sagittal crest more prominent, and the zygomatic arches spread out more laterally. If this interpretation is correct, then the differences ascribed to *Spilogale ambiguus* and *Spilogale arizonae* are ones of age differences and not worthy of specific consideration.

The spotted skunks in the Huachucas are large in external size. Comparative sizes for total length are: Huachucas, 401.1; Grand Canyon and Panamint Mts., 381; Chihuahua and Jalisco, 377; lower Rio Grande Valley, 402. Tail length for corresponding localities are: 146.0, 143, 121, 145; hind foot, 47.0, 44.3, 45.5, 47.7. In size, material from the Huachucas is more like *leucoparia* from the Rio Grande Valley. However, inadequate measurements are available from critical areas. We surmise that when adequate material is studied, *Spilogale arizonae* and *S. gracilis* may prove to be con-subspecific and that the spotted skunks of southeastern Arizona, southwestern New Mexico, northern Sonora, and northern Chihuahua will represent a distinct race, for which the name *ambiguus* would be applicable. Until all the material has been studied, we propose to use the name *ambiguus*. When the material is studied, it seems likely that all named forms in northern Mexico and the United States will prove to belong to one species, for which the earliest name would be *Spilogale putorius* Linnaeus, 1758.

Some of the specimens from the Huachucas have white on top of the forelegs, some none: considerable white on foreleg, 4; little white, 3; trace, 2; no white, 3. White may be present on the top of the hind feet: broad stripe present, 1; narrow stripe, 3; spot, only, 5; none, 3.

Measurements.—Eight adult males¹, average and extremes, and 1 adult female¹ measure: total length, 401.1(385–440), 354; tail, 146.0(133–163), 138; hind foot, 47.0(44–52), 42; ear from notch, 29.3(27–32), 25; basilar length, 48.6(45.1–51.5), 41.8; occipitonasal length (from occipital bulge above foramen magnum), 50.9(47.7–54.8), 45.0; greatest zygomatic breadth, 35.9(33.8–37.3), 29.6; greatest mastoidal breadth, 32.2(29.8–35.3), 26.7; least interorbital breadth, 15.3(14.1–16.3), 13.4; palatilar length, 19.4(18.3–19.9), 17.1; postpalatal length, 29.1(27.0–31.3), 24.8; foramen magnum to plane of last molar, 29.3(27.1–31.7), 24.8; height of cranium, from near basisphenoid-basioccipital suture to top cranium exclusive of crest, 17.0(16.1–17.4), 15.4; crown length maxillary toothrow, 17.9(16.9–18.8), 16.3.

Remarks.—Spotted skunks occur in the wooded portion of the Mountains, and may be restricted to the oak belt. We found them to be abundant in the oak belt in the mouth of Miller Canyon. "Two specimens were trapped in a meat house at a ranch" by Price (in Allen, 1895:252)

in January, and he "obtained evidence of the occurrence of the Little Striped Skunk at many other places. . . ."

Nine of the specimens were surely infected with worms in the frontal sinuses, for one or more lesions had been formed in the skull in these specimens. Infections at the base of the teeth were evident in 3 specimens.

Three of our specimens taken on August 6, 9, and 10 are young. The sutures between the maxillae-nasals and the premaxillae-nasals are open. In weasels, those specimens with the sutures in this condition would be between 3- and 7½-months old (Hall, 1951). According to Crabb's (1941) measurements for *Spilogale interrupta*, animals with these external measurements would be between 45- and 60-days old. These animals may have been born in late May or early June.

***Mephitis mephitis estor* Merriam**

STRIPED SKUNK

Mephitis estor Merriam, No. Amer. Fauna, 3:81, 1890. Near Little Spring, 8200 ft., San Francisco Mountain, Coconino Co., Arizona.

Mephitis mephitis estor, Hall, Univ. Calif. Publ. Zool., 37:1, 1931.

Records of occurrence.—Fort Huachuca, 1¹; Carr Canyon (about half-way up), 2²; mouth of Miller Canyon, 1³. Other record: "Huachuca Mountains," 1 (Chicago Nat. Hist. Mus.).

Comparisons.—Our specimens have a short tail, characteristic of *M. m. estor*. One specimen has much white on the body and tail, the white hairs in the tail being nearly as abundant as the black hairs. Another has very few white hairs in the tail, with a few at the base and a terminal tuft. The other 2 specimens are intermediate as regards white hairs in the tail.

Measurements.—Two adult males^{2, 3} and 1 adult¹ and 1 young adult² female give the following measurements, respectively: total length, 645, 677, 665, 617; tail, 295, 317, 336, 294; hind foot, 70, 75, 67, 74; ear from notch, 28, 29, 33, 27; basal length, 62.9, 64.5, 61.0, 56.3; basilar length, 60.9, 62.6, 59.1, 54.4; greatest zygomatic breadth, 41.9, 45.2, 42.7, 38.7; greatest mastoidal breadth, 37.4, 38.3, 36.3, 34.3; breadth across post-orbital processes, 20.0, 21.4, 21.2, 20.8; least interorbital breadth, 19.6, 20.2, 20.1, 18.6; palatilar length, 26.8, 26.2, 24.2, 23.0; postpalatal length, 35.2, 37.1, 35.3, 31.5; foramen to plane of last molars, 34.2, 36.7, 34.6, 31.2; crown length maxillary toothrow, 23.8, 23.2, 22.0, 21.6.

Remarks.—Striped skunks are common throughout the Mountains. At times, they become pests at the Fort and cause some "damage" there. For example, in August, 1950, one got itself caught by tumbling into a

garbage can and was turned over to us alive. Another was observed foraging in the oaks between Bear and Cave Creek canyons about 2 hours after dark. The striped skunk occurs in the oak belt and to some extent below the oak belt on the alluvial fans.

A striped skunk that had its den in a barn in the mouth of Miller Canyon was feeding heavily upon beetles and grasshoppers in July and August, judging by its droppings.

***Mephitis macroura milleri* Mearns**

HOODED SKUNK

Mephitis milleri Mearns, Proc. U.S. Nat. Mus., 20:467, 1897. Fort Lowell (near Tucson), Pima Co., Arizona.

Mephitis macroura milleri, Allen, Bull. Amer. Mus. Nat. Hist., 14:334, 1901.

Records of occurrence.—Mouth of Miller Canyon, 1¹; "Huachuca Mountains," 1² (Chicago Nat. Hist. Mus.). Other records: Fort Huachuca, 7 (see Howell, 1901:42).

Comparisons.—The 2 specimens are a juvenile and a young adult that seem referable to this subspecies.

Measurements.—Juvenal male¹ with unfused sutures: total length, 465; tail, 241; hind foot, 57; ear, 33. Cranial measurement of young female² and juvenal male¹ are: basal length, —, 47.1; basilar length, 53.5, 45.2; greatest zygomatic breadth, 37.7, 31.8; greatest mastoidal breadth, 31.3, 29.4; breadth across postorbital processes, —, 17.4; least interorbital breadth, 18.9, 15.1; palatilar length, 22.7, 19.8; postpalatal length, —, 25.7; crown length of maxillary toothrow, 21.7, 19.4.

Remarks.—The specimen from Miller Canyon was discovered under a door. The door was flat on the ground in the yard of an abandoned house. We were in search of *Notiosorex crawfordi*, for we had seen one beneath a board alongside this door. The skunk, when exposed during the middle of the day, made no attempt to run and we shot it. Judging from the lack of fusion of the sutures, we assume the animal was a young of the year. If the condition of the sutures is in any way similar to that in long-tailed weasels, *Mustela frenata*, as summarized by Hall (1951:25), we would estimate that the animal was between 3 and 7½ months old. We encountered no adults of this species, although we did take several adult striped skunks. All of those persons living in the Huachucas, keenly interested in and acquainted with the larger mammals, understandably were unable to distinguish between the hooded skunk and the striped skunk, for they are very similar in appearance here.

The not fully adult female was taken by G. F. Breninger and had at least 4 pairs of well-developed mammary glands when taken August 21, 1901.

Conepatus mesoleucus venaticus* Goldman*HOG-NOSED SKUNK**

Conepatus mesoleucus venaticus Goldman, Jour. Mamm., 3:40, 1922.

Casper Ranch, 5000 ft., Blue River, 12 mi. S Blue, Greenlee Co., Arizona.

Records of occurrence.—Carr Canyon, 6500 ft., 1¹; Garden Canyon, 6700 ft., 3² (skulls only). Other records: "Fort Huachuca," 1 (U.S. Nat. Mus., see Goldman, 1922:41); 2 (Chicago Nat. Hist. Mus.).

Comparisons.—On a geographic basis, our specimens should be referable to *venaticus* and not to *C. m. mearnsi* (Mason, Texas). However, several of the diagnostic features of *venaticus*, as described by Goldman, are not evident in our material. The chief diagnostic features concerned the narrowness of the skull, yet our specimens are broader through the interorbital region than is an adult male of *mearnsi* from the Big Bend area of Texas. However, in overall small size of both skull and external features, the Huachucan specimens agree most closely with *venaticus* and are probably best referred to this race.

Measurements.—One young adult male¹ and skulls of a fully adult³ and of a young adult², unsexed, individual give the following measurements: total length, 525, —, —; tail, 170, —, —; hind foot, 76, —, —; ear, 28, —, —; greatest length of skull in median line, 73.5, 73.9, 73.4; condylobasal length, 71.1, 72.0, 70.7; basal length, 64.9, 65.7, 64.7; basilar length, 62.5, 62.0, 61.5; greatest zygomatic breadth, 49.6, 48.2, 46.6; greatest mastoidal breadth, 39.9, 39.9, 37.8; width of braincase at constriction behind zygomata, 36.5, 36.8, 35.1; least interorbital breadth, 21.8, 23.4, 22.5; palatilar length, 30.0, 28.1, 28.6; crown length maxillary toothrow, 23.0, 23.0, 22.5.

Remarks.—Sign of hog-nosed skunks, chiefly in the form of "rooting" in the softer ground, is fairly common throughout the wooded portions of the Mountains. It is always difficult to distinguish between the rooting of *Conepatus* and *Nasua*. On occasions, particularly in the winter, the hog-nosed skunks will come into the orchards and literally plow the soil in search for food.

Conepatus frequently makes use of abandoned mine shafts for den sites, and Henry Van Horn and Carl Joerger knew of one shaft being so occupied in Bear Canyon.

None of the skulls of *Conepatus* exhibits lesions from nasal worms. One female, in the Chicago Natural History Museum, taken July 10, 1901, has at least 3 pairs (and perhaps only 3 pairs) of well-developed mammary glands.

Taxidea taxus sonoriensis Goldman**BADGER**

Taxidea taxus sonoriensis Goldman, Jour. Wash. Acad. Sci., 29:300, 1939. Camoa, Rio Mayo, Sonora, Mexico.

Records of occurrence.—14 mi. SE Fort Huachuca, 1; occurs at mouths of some canyons on alluvial fans.

Comparisons.—The above specimen agrees closely with *T. t. sonoriensis*, as described by Goldman (1939:301), particularly in small size, dark color, white median stripe continuing only to shoulders and re-appearing once at middle of back as a narrow, 4-cm.-long stripe, blackish chin, buffy abdominal area, except white mid-ventral line extending from posterior part of throat to base of tail, abruptly narrowed nasals posterior to maxillo-frontal suture. The above specimen differs from *T. t. sonoriensis*, as described by Goldman, in throat and underside of neck being a buffy cream rather than "pure white" and upper side of tail being buffy or cinnamon rather than dark as the back.

The specimen from 14 mi. SE Fort Huachuca is practically a topotype of *Taxidea taxus apache* Schantz (1948:175), for it is from 7 miles north of the type locality (San Pedro River, at the International Boundary, Cochise Co., Ariz.-Sonora). Our specimen differs from *T. t. apache*, judging from Schantz's description, in incomplete dorsal white stripe rather than one continuing to base of tail, dorsal coloration that is dark rather than grayish, chin blackish rather than brown, and ventral median light stripe whitish rather than buffy. These above features in which our specimen differs from *T. t. apache* are the very ones judged by Goldman as diagnostic of his subspecies. Actually, our specimen shows similarity to *T. t. sonoriensis* in all of these "diagnostic" features. Recorded measurements of the few skulls of *apache* and *sonoriensis* show no significant differences. We believe that the features ascribed to *apache* are within the range of variation of *T. t. sonoriensis*, and that *apache* best be regarded as a synonym of that form.

Measurements.—Subadult female, 14 mi. SE Fort Huachuca, adult female and young adult male topotype of *sonoriensis* (after Goldman, 1939:301), and young adult female topotype of *apache* and average of 4 females from southeastern Arizona (after Schantz, 1948:176): total length, 635, 625, 662, 640, —; tail, 109, 110, 122, 132, —; hind foot, 95, 107, 100, 104, —; condylobasal length, 116, 113, 114.7, 116.4, 115 (112.7-117.5); zygomatic breadth, 70.9, 70.9, 69.8, 70.3, 70.7(69.1-74.4); mastoidal breadth, 71.5, 69.5, 70.7, 70.3, 69.8(64.5-76.3); interorbital breadth, 25.2, 25.2, 24.2, 25, 26(25-26.8); postorbital constriction, 27.4, 28.6, 27.4, 27, 26.8(26.3-27.6); alveolar length of maxillary toothrow, 37.9, 38.5, 35.8, 37.7, 33(37.6-39.2).

Remarks.—Badgers do not get into the Mountains proper, but only onto the alluvial fans of the canyons. At the mouth of Brown Canyon there is abundant sign of badger. Our specimen was taken just a short distance from the mouth of Carr Canyon when it ran across the road about 11 p.m.

Badgers formerly occurred in the sacaton in the flats at the northwest end of the Mountains according to Stanley Young. He said they were present around the "towns" of prairie dogs, also.

***Vulpes macrotis neomexicana* Merriam**

KIT FOX

Vulpes macrotis neomexicanus Merriam, Proc. Biol. Soc. Wash., 15: 74, 1902. San Andreas Range, Doña Ana Co., New Mexico.

Records of occurrence.—Fort Huachuca (skull only, U.S. Nat. Mus., 45546, not examined).

Remarks.—The above skull was taken from an old carcass by Dr. A. K. Fisher, on May 11, 1892 (*in litt.*, Stanley P. Young). Kit foxes apparently have long since been exterminated from the Huachucas; none of the local residents could provide us with information on their former occurrence.

***Urocyon cinereoargenteus scottii* Mearns**

GRAY FOX

Urocyon virginianus scottii Mearns, Bull. Amer. Mus. Nat. Hist., 3: 236, 1891. Pinal County, Arizona.

Urocyon cinereo-argenteus scottii, Allen, Bull. Amer. Mus. Nat. Hist., 7:253, 1895.

Records of occurrence.—3½ mi. W Fort Huachuca, 1¹(skull only); ½ mi. W Ft. Huachuca, 3²(skulls only); Carr Canyon, 2³; Miller Canyon, 2⁴.

Comparisons.—The above specimens are referable to *U. c. scottii* as judged by the pale dorsal coloration, light coloration of legs, long tail, and small skull.

Measurements.—Two males (4091³, 4094⁴), 2 females (4092³, 4093⁴), and 4 unsexed skulls only (4087¹, 4088², 4089², 4090²): total length, 965, —, 980, 949; tail, 400, —, 410, 379; hind foot, 140, —, 127, 122; ear, 76, —, 77, 70; condylobasal length of skull, —, 118, 116, 114.5, 120, 120, 113.5, —; basilar length, 108, 108, 107, 105, 110, 109, 104, 110; greatest zygomatic breadth, 65.5, 66.5, 62.7, 63.9, 64.6, 68.4, 66.7, 68.2; breadth of braincase (above base of zygomatic arch), 46.7, 43.4, 44.3, 45.2, 44.8, 47.5, 44.4, 47.6; least interorbital constriction, 24.9, 24.7, 23.1, 23.6, 22.4, 25.0, 23.1, 24.5; greatest length of nasals, 39.7, 39.2, 38.6, 38.6,

39.2, 43.0, 38.8, 39.5; alveolar length of maxillary toothrow, 49.1, 49.7, 48.4, 49.6, 50.0, 51.5, 48.8, 50.3.

Remarks.—Gray foxes are one of the commonest of the larger mammals in the Mountains. They occur in the mouths of the canyons, in the oak and juniper at the intermediate altitudes, and less frequently on up into the higher mountains. They rarely occur on the lower flats. That gray foxes are common is attested to by the fact that about 50 were taken from April to July, 1949, by Earl Long, during a predator-control program in the Mountains. Fox sign is evident nearly everywhere in the Mountains. Just west of Sunnyside, among a rather heavy stand of junipers, a gray fox trotted down the road in the evening directly into the glare of the headlights of our standing car, and when within 100 feet of the car he slowly bounded off into the trees.

Most droppings judged to be those of gray fox were composed of berries. That the animals also feed on carrion or decaying meat at times is evidenced by the presence of several maggots in the stomach of one fox. The skulls of the specimens at hand show several abnormalities: 4091 lacks numerous teeth (all upper incisors, right lower Pm 2, M 2, M 3, left lower Pm 2, Pm 3, M 1, and M 2) with their alveoli partially or completely closed, and it has 2 fenestrations in the anterior part of the upper palate and one in the left nasal; 4090 lacks the right upper carnassial and 3 upper left incisors, and the alveoli are fused; bregmatic bones are present in 4092 and 4090.

Canis latrans mearnsi Merriam

COYOTE

Canis mearnsi Merriam, Proc. Biol. Soc. Wash., 11:29, 1897. Quito-baquito, Pima Co., Arizona.

Canis latrans mearnsi, Nelson, Proc. Biol. Soc. Wash., 45:224, 1932.

Records of occurrence.—Mouth of Miller Canyon, 1; Garden Canyon, 5900 ft., 1(skull only); "plains near Ft. Huachuca," 1(skull only).

Comparisons.—The above 3 specimens, together with 7 others (skulls only) from 3 miles NE Fry (outside the area here studied), are referable to *C. l. mearnsi*. The specimens are small, both externally and cranially, as in *mearnsi*. The pelage of the Miller Canyon specimen is extremely worn and has little of the rich, bright color ascribed to *mearnsi* by Merriam, although the muzzle, top of head, ears, legs, and feet are fulvous to cinnamon in color.

Measurements.—See Table 4.

Remarks.—Coyotes were not abundant in the Huachucas in 1949, 1950, or 1951. They may never have been abundant up in the Mountains proper. We suspect they are commoner on the flats below 5000 feet, al-

TABLE 4. Measurements of wolves (*Canis lupus baileyi*) and coyotes (*Canis latrans mearnsi*).

Total length	Hind foot length	Tail length	Greatest length of skull	Condyllobasal length	Width of rostrum	Greatest length nasals	Squamosal constriction	Postorbital constriction	Crown length of maxillary toothrow	Alveolar length of maxillary toothrow	Crown length of maxillary toothrow	Alveolar length of maxillary toothrow	Upper carnassial crown length	Lower carnassial crown width	
									Canis lupus baileyi, males, Huachuca Mountains, Arizona	Canis lupus baileyi, females, Huachuca Mountains, Arizona	Canis lupus baileyi, males, Animas Mountains and Valley, New Mexico	Canis lupus baileyi, females, Animas Mountains and Valley, New Mexico	Canis latrans meekisi, all judged to be males, vicinity of Huachuca Mountains	Canis latrans meekisi, all judged to be males, vicinity of Huachuca Mountains	
4109	1480	385	243	228	216	127	76	81.6	40.7	41.3	38.2	94.3	93.5	24.2	12.6
4107	...	...	...	236	...	125	77	89.3	38.2	40.7	38.8	101.2	99.5	24.1	13.2
average of 9)	1587.3 ^{a,b}	418.8 ^b	...	234.3	215.7	129.3	74.1	86.4	40.4	42.3	37.4	96.6	94.1	24.2	13.1
average of 6)	1536.8 ^b	406.0 ^b	...	224.8	206.5	122.7	71.2	83.9	37.8	38.6	37.9	92.1	90.3	23.1	12.5
average of 7)	1140 ^c	310 ^c	192 ^c	189.3	178.3	96.5	57.7	71.5	28.6	34.6	32.2	83.2	80.9	19.7	9.5

A Superior number indicates the actual number of specimens employed to obtain this average.

though frequently they occur on the alluvial fans at the mouths of the canyons. In the summer of 1949, coyotes were heard on the flats adjacent to Carr, Miller, and Ramsey canyons. The specimen collected in Miller Canyon was at the lower edge of the oak belt. This specimen ran across the Miller Canyon road about 10:30 a.m., in an area where there was little cover, and took refuge among some logs on the ground. It remained here while we stopped the car, extricated a gun, and shot it.

Extensive control of coyotes in and around the Mountains has kept the population low. Just to the northeast of the Mountains, at 3 miles northeast of Fry, a government trapper obtained at least 15 coyotes in 4 months in 1949. In spite of these operations, coyotes continue to exist around the Huachucas, probably in good part because of an influx from Mexico. We suspect that the high rabbit population (particularly jack rabbits) in 1950 was correlated with the very low coyote population.

Canis lupus baileyi Nelson and Goldman

GRAY WOLF, TIMBER WOLF

Canis nubilus baileyi Nelson and Goldman, Jour. Mamm., 10:165, 1929. Colonia Garcia, 6700 ft., Chihuahua, Mexico.

Canis lupus baileyi, Goldman, Jour. Mamm., 18:45, 1937.

Records of occurrence.—“Huachuca Mountains,” 2(skulls only); “Fort Huachuca,” 1(skull only); Canelo Hills (trailed from Canelo Gate in Huachucas), 1; Red Rock Canyon (also trailed from Canelo Gate in Huachucas), 1(skull only); 18 mi. E Parker Canyon, SW side Huachuca Mts., 1(U.S. Nat. Mus., see Young and Goldman, 1944:471).

Comparisons.—The five specimens from the Huachucas are small, and of about the same size as the 15 specimens (all skulls only) from the Animas Mountains and Animas Valley, some 100 miles to the east, in New Mexico. Our specimens are not much larger than red wolves from central Texas (*Canis niger rufus*) and smaller than red wolves from eastern Texas (*C. n. gregoryi*). The one skin available is dark on the back from the shoulders posterior to and over the rump. Otherwise, it is quite reddish, being reddish from the forehead back to the shoulders, between and around the ears, along the sides of the body, and on the outer surfaces of the legs. The throat is whitish, but slightly tinged with cinnamon; the chest is grizzled gray with a white patch just in front of the forelegs. The belly is light reddish. This specimen apparently is more reddish than the “unusually rich rufescent” specimen mentioned by Young and Goldman (1944:469) from Helvetia, Arizona. Specimens from the Huachucas show no approach to *C. l. mogollonensis* as near as we can ascertain.

Measurements.—See Table 4.



FIG. 23. Adult wolf, *Canis lupus baileyi*, trapped in the Canelo Hills. Previously this animal forayed at the north end of the Huachuca Mountains near Canelo Gate. Photographed August, 1950, by R. G. Van Gelder.

Remarks.—Wolves are present rather frequently in the Huachucas, principally, if not exclusively, at the present time along the western side. Their presence along the western side is correlated with a well-defined wolf runway which extends between the Patagonia and Huachuca mountains, and is well described by Young (Young and Goldman, 1944:82-83, pls. 19-21). Wolves were reported to us from the following localities along the western base: Canelo Gate, near the Canelo Mine (by Earl Long); near Cave Creek (by Lincoln Hathaway); near Sylvania, at the saddle of Garden Canyon (by Charles Wallmo); and the southwest side of the Huachucas, 18 miles east of Parker (by Stanley Young). We have numerous reports of wolves from the Patagonia Mountains and the Canelo Hills, and the wolf runway probably goes nearer these mountains than the Huachucas. This is so indicated by Young. Wolves, however, consistently occur in the Huachucas: at least 2 wolves were taken there in the fiscal year (July 1 to June 30) 1944-1945, one in 1945-1946, 2 in 1949-1950, 2 in 1950-1951. In 1942 a pair of wolves raised 6 pups in the Huachucas, with the male and 6 young being collected, according to Everett M. Mercer of the U.S. Fish and Wildlife Service. Two females from the Animas Mountains, New Mexico, had 5 and 7 embryos when collected on March 24 and March 31, and probably would have given birth to young early in April.

The absence of a well-organized wolf control program in those parts

of Mexico just to the south of the Huachuca, Santa Cruz, and Patagonia mountains assures a continuous reservoir of wolves to filter into the United States. The unchecked burning of some mountains in northern Sonora may hasten the movement of wolves into Arizona.

Felis onca arizonensis Goldman

JAGUAR

Felis onca arizonensis Goldman, Proc. Biol. Soc. Wash., 45:144, 1932.
Cibecue, Navajo Co., Arizona.

Records of occurrence.—See *Remarks*.

Remarks.—The jaguar, or *tigre*, as it is locally known, is not resident in the Huachucas, but infrequently visits there. Frank Colcord, a government trapper, “ran” a “tigre” north of Sunnyside about 1933. In the southern end of the Mountains, Mr. D’Albini only rarely has known of jaguars. Although there are numerous reports of jaguars being seen and hunted in the Huachucas, no specimens were ever actually killed there, as far as we could determine. Two specimens in the U.S. National Museum were taken within 25 miles of the north end of the Huachucas, at Greaterville in the Santa Rita Mountains (see Nelson and Goldman, 1933:238).

Stanley Young informs us he saw tracks of the jaguar just to the north of Sunnyside sometime between 1917 and 1919. He thought the presence of the jaguar there might be correlated with the presence of peccaries.

Felis concolor azteca Merriam

MOUNTAIN LION, PUMA

Felis hippolestes aztecus Merriam, Proc. Wash. Acad. Sci., 3:592, 1901. Colonia Garcia, 6700 ft., Chihuahua, Mexico.
Felis concolor azteca, Nelson and Goldman, Jour. Mamm., 10:347, 1929.

Records of occurrence.—Huachuca Mts., skull only, 1 (see Allen, 1895: 253, not examined).

Remarks.—The Huachuca Mountains have produced between 4 and 5 lions each year during the past 30 years according to Earl Long, government trapper. This yield may be even higher, as Everett Mercer, predator control agent at Phoenix, feels the Mountains may produce as high as 7 to 11 lions annually. Mercer’s estimate was based on the annual take of lions in the Mountains. Some mountain lions may have been produced in the Huachucas and moved out before being trapped, and vice versa, but Mr. Long did not regard this as greatly affecting the accuracy of his estimate. During the fiscal year 1949-1950, 7 lions were taken in the Mountains, and this take was higher than usual, according

to Long. From January 1 through March 31, 1951, 7 more lions were taken in the Huachucas by the Lee brothers. Pumas have been sought by government and private trappers for many years in the Huachucas. The bounty per animal has varied from \$50 to \$100.

The puma prefers the rimrock, just below the top of the peaks, but ranges over all the Mountains. One was encountered within 100 yards of Louis Seeman's house on Carr Canyon Reef in November, 1948. The lion was seen by Mrs. Seeman when she went in search of her pet deer which had failed to appear. The lion remained near the house long enough for firearms to be obtained and was shot. According to the Seemans, the over-all length of the collected specimen was 6 feet, 3 inches. Old-time residents indicated that pumas are as abundant as ever in the Mountains in spite of control measures. Only occasionally were complaints heard of lions preying on cattle; the common prey apparently is deer, of which there is an abundance. However, Stanley Young told us that lions preyed heavily upon young horses in Corn Canyon, on the west side of the Huachucas, in the late 1910's.

W. W. Price in 1894 found the mountain lion common in the Mountains. He records (Allen, 1895:254) an interesting behavior for pumas in the Huachucas: "On Feb. 16, at nightfall near the summit of the range, two lions came mewing about the door of a miner's cabin. The man shot through the door, killing one, a gaunt female. The next day he threw the skinned carcass a short distance from the house. During the night the other lion came and ate nearly the whole of it; on the following evening the animal again returned, uttering a low peculiar cry. The miner wounded this one, but it escaped into the thick brush. In company with the man I trailed the beast some distance through the snow, but we finally lost the track."

Young (in Young and Goldman, 1946:57) records a bluish color in the coat of an adult male puma taken between Lyle and Parker canyons, near the Huachucas.

Herpailurus yagouaroundi cacomitli (Berlandier)

JAGUARUNDI

Felis cacomitli Berlandier, in Baird, Rep. U.S. Mexican Boundary Surv., 2:pt. 2:12, 1859. Matamoros, Tamaulipas, Mexico.

Records of occurrence.—3 mi. E Canelo Ranger Station, sec. 1, T. 22 S., R. 18 E., 5000 ft., in Santa Cruz County (see Little, 1938:501).

Remarks.—Our observations and repeated inquiries gave no indication of the presence of the jaguarundi or the ocelot (*Felis pardalis*) in the Huachucas. However, there is a report in the Journal of Mammalogy (Little, 1938:500-501) of a "catlike mammal, which was later identified

as an adult jaguarundi" from the northwest end of the Huachuca Mountains. Elbert L. Little, Jr., and George S. Meagher on March 17, 1938, observed the animal at the above locality as it crossed and recrossed an arroyo from a knoll. This was in the semi-desert grassland where there is a scattering of Emory oaks. Both men had good views of the animal. No description is given of the observed jaguarundi so the color phase is not mentioned.

We follow Hershkovitz (1951:564-565) in the nomenclature of these cats and assume that *tolteca* is a synonym of *cacomitli*.

Lynx rufus baileyi Merriam

BOBCAT

Lynx baileyi Merriam, No. Amer. Fauna, 3:79, 1890. Moccasin Spring, Coconino Co., Arizona.

Lynx rufus baileyi, Burt, Trans. San Diego Soc. Nat. Hist., 7:402, 1934.

Records of occurrence.—Carr Canyon, 1¹; head of Garden Canyon, 1²(skull only); Split Rock Canyon, 1³(skull only); "Huachuca Mountains," 1⁴(see Allen, 1895:253).

Comparisons.—The skin from the Carr Canyon specimen and another from one 5 mi. SE Hereford, Cochise County, are exceedingly buffy, with little blackish; the foreheads are somewhat grizzled as the hairs are strongly tipped with white; the chests and bellies are white, abundantly spotted with black or black and brown; skulls, small (see measurements). The above specimens are referred to *L. r. baileyi*, but if we knew more about *L. r. texensis* we might have referred the material to that subspecies.

Measurements.—For an adult male⁴ and subadult female¹ are: total, 770, 640; tail, 155, 153; hind foot, 165, 160; ear, 80, 70. The same measurements for an adult male from 5 mi. SE Hereford are: 835, 160, 175, 75. Cranial measurements of the adult male from Hereford, and 2 other adults,^{2, 3} both believed to be males, and a subadult female¹, are: greatest length, 119, 116, 120, 107; condylobasal length, 109, 108, 110, 99.1; zygomatic breadth, 82.9, 87.8, 88.8, 76.3; least interorbital breadth, 25.6, 25.4, 26.5, 20.3; breadth across postorbital processes, 55.6, 62.1, 62.3, 51.8; greatest width of nasals, 17.6, 15.6, 16.7, 14.2; greatest length of nasals, 33.9, 30.5, 30.3, 28.0; alveolar length of maxillary toothrow, 38.5, 36.1, 39.0, 33.0; crown length of upper carnassial, 14.5, 14.0, 15.7, 13.6; crown width of upper carnassial, 6.8, 6.8, 7.5, 6.8.

Remarks.—Bobcats in the Huachucas, in our experience, occur in a variety of habitats, for we trapped one among oaks and manzanita, well up in Carr Canyon, saw another on the treeless, grass covered flat along

the west side of the Huachucas, 12 miles south of the Fort, and obtained another that was struck by a car on the highway near the San Pedro River, in an area of mesquite and a few cottonwoods.

Bobcats are not rare in the Mountains. During predatory control work in the Mountains, 13 were taken in 1949.

Citellus spilosoma canescens (Merriam)

SPOTTED GROUND SQUIRREL

Spermophilus canescens Merriam, No. Amer. Fauna, 4:38, 1890.

Willcox, Cochise Co., Arizona.

Citellus spilosoma canescens, Bailey, No. Amer. Fauna, 53:109, 1931.

Records of occurrence.—Flats 7 mi. ESE Fort Huachuca, 1¹; flats 8 mi. SE Fort, 2²; mouth of Carr Canyon, 2³; mouth of Miller Canyon, 9⁴; mouth of Montezuma Canyon, 1. Other records: Huachuca Plains, 2 (Chicago Nat. Hist. Mus.); Fort Huachuca, 9 (U.S. Nat. Mus., according to Howell, 1938:128); "Huachuca Mountains," 3 (Carnegie Mus., according to Howell, 1938:128).

Comparisons.—Our material is referable to *C. s. canescens*, described from nearby Willcox, but in some adult animals the number of spots on the back is reduced to the point where they are almost totally lacking.

Measurements.—Of 2⁴ males (adult and subadult) and 7¹⁻³ females (adults and subadults, averages with extremes): total length, ♂, —, 202, ♀, 214.7(205-238); tail, —, 64, 69.7(60-80); hind foot, 34, 35, 33.6(32-36); ear from notch, 9, 11, 11.6(10-14); greatest length of skull, 39.5, 39.0, 38.0(37.1-39.4); palatilar length, 18.3, 18.3, 17.1(16.7-18.3); zygomatic breadth, 23.8, 23.3, 23.1(21.7-24.2); cranial breadth, 19.0, 18.5, 18.4(18.2-19.0); interorbital breadth, 8.5, 8.3, 8.6(8.1-9.3); postorbital constriction, 14.6, 14.5, 14.7(14.0-16.0); length of nasals, 12.8, 13.5, 12.5(11.8-13.6); maxillary toothrow, 7.4, 7.5, 7.4(7.0-7.9).

Remarks.—Spotted ground squirrels occurred on and below the alluvial fans along the eastern and northern edge of the Huachucas. They were not encountered along the western edge of the Mountains, and the altitude and plant belts there may be too high for their occurrence. At no place within the area studied were spotted ground squirrels abundant, and even where they did occur in the Mountains, they are probably reaching the upper limits of their zonal tolerance.

Spotted ground squirrels were found closely associated with the kangaroo rats *Dipodomys spectabilis*, *D. merriami*, and *D. ordii* in Montezuma and Ramsey canyons. In some canyons spotted ground squirrels were present even above the "dipo" zone. In Miller Canyon they occurred in the grassy fields nearly to the edge of the thick stands of oak.

One female carried 5 embryos on August 6. At least 3 of our specimens appear to be nearly full-grown young of the year, but we cannot be sure of this. If these are young of the year, they appear to be nearly large enough to bear a litter of young in the summer of their birth.

***Citellus variegatus grammurus* (Say)**

ROCK SQUIRREL

S[ciurus] grammurus Say, Long's Exped. Rocky Mts., 2:72, 1823.

Designated as Purgatory River, near mouth of Chacuaco Creek,
Las Animas Co., Colorado.

[*Citellus variegatus*] *grammurus*, Elliot, Field Columb. Mus. Publ.,
zool. ser., 4:149, 1904.

Records of occurrence.—Miller Canyon, 17¹; Carr Canyon, 1². Other records: "Huachuca Mountains," 3(Chicago Nat. Hist. Mus.), 4(Mus. Zool. Univ. Mich.); Fort Huachuca, 30(U.S. Nat. Mus., see Howell, 1938:144).

Comparisons.—Compared with *C. v. grammurus*, our specimens average darker, with less Pinkish Cinnamon on the back and less Pinkish Buff on the head, with the fresh pelage of the back and parts of the head being nearly uniformly gray. Howell (1938:143) also points out that occasional specimens from Fort Huachuca have only a very slight wash of buff and the backs are clear grayish. However, we refer our material, as Howell (1938) does his, from the Huachucas, to *C. v. grammurus*.

Measurements.—Average, minimum, and maximum measurements for 9 adult males^{1, 2} and 6 adult females¹ are respectively: total length, 461.4⁸(425–513), 470.2(444–522); tail, 206.1⁷(179–226), 203.8(193–223); hind foot, 63.4(56–74), 57.5(53–61); ear from notch, 27.0⁸(25–29), 27.2(26–30); greatest length of skull, 60.7(58.0–61.9), 59.8(57.6–61.1); palatilar length, 28.8(27.9–29.2), 27.9(27.3–28.4); zygomatic breadth, 36.9(35.2–37.9), 36.8(35.0–38.2); cranial breadth, 25.2(24.4–26.5), 24.6(23.8–25.9); interorbital breadth, 14.5(13.7–16.1), 14.7(13.7–15.5); postorbital constriction, 17.5(16.6–19.1), 17.4(16.8–18.7); length of nasals, 21.9(20.7–22.6), 21.6(20.4–23.5); maxillary toothrow, 11.8(11.1–12.4), 12.0(11.8–12.3).

Remarks.—Rock squirrels are to be found throughout the Mountains wherever there are suitable rocks. They were present at 7200 feet among Douglas fir and pines on Carr Canyon Reef in the rocks supporting mine machinery. *C. variegatus* were present in all the rocky portions of the canyons as low as 5000 feet. The ranges of the rock squirrel and gray squirrel (*Sciurus arizonae huachuca*) overlap in a few places, as at 6900 feet in Carr Canyon, where the rock squirrels were in the rocks at the

base of rock outcrops and the gray squirrels were in the pines, firs, and oaks growing among these same rocks. The rock squirrels inhabited the alluvial fans at the mouths of the canyons where suitable rocks were interspersed. The squirrels frequently took up their abode beneath buildings, at considerable distances from rocks, and became nuisances around settlements. As early as 1893, Price (in Allen, 1895:237) says "they were very troublesome. A few minutes after our leaving the cabin they would swarm down from the cañon sides and carry off everything that was not securely boxed—bread, pork, dried fruit and potatoes; nothing came amiss to them. On our return they would scatter to the rocks, and for long after there would be a chorus of shrill chattering calls." Rock squirrels either are attracted to decaying meat as a source of food or have a strong curiosity, for 4 squirrels were taken in steel traps baited with buried, "ripe" carcasses of other animals. A. K. Fisher's (1892) experience in the Huachucas indicated that the rock squirrel "is an expert climber and was often seen in the tops of the large live oaks. . . ."

Rock squirrels in the Huachucas have at least 2 litters of young each year. In August, we saw and collected young individuals that were not more than one-third the weight of adults. We surmise that these were born in late May. Another litter might be expected in late August, for one female, taken on August 18, had 6 well-developed embryos.

It is not known to us whether rock squirrels hibernate in the Huachucas, but Price (in Allen, 1895:235) indicates that "it is probable that they hibernate during the colder part of the year, as the first specimens seen were on a warm day, Feb. 7, at the mouth of a cañon. . . ." It seems likely that not all of the squirrels would hibernate, for the litters produced in late August or early September may not have stored up enough fat for a prolonged period of dormancy.

Of the 15 adults collected in August, 12 were molting. In most, the molt was about two-thirds completed. There seems to be little correlation between molt of the tail with molt on the body, for on some specimens the molt was complete on the tail; on others, partially complete; and on some, not present.

***Cynomys ludovicianus arizonensis* Mearns**

BLACK-TAILED PRAIRIE DOG

Cynomys arizonensis Mearns, Bull. Amer. Mus. Nat. Hist., 2:305,

1890. Point of Mountain, near Willcox, Cochise Co., Arizona.

C[y]nomys] ludovicianus arizonensis, Merriam, Proc. Biol. Soc. Wash., 7:158, 1892.

Records of occurrence.—Now extinct; formerly Fort Huachuca, 10(U.S. Nat. Mus., see Hollister, 1916:21); "Huachuca Mountains," 1¹(Chicago Nat. Hist. Mus.); "Huachuca Plains," 1²(Chicago Nat. Hist. Mus.); 6 mi. SE Fort Huachuca, 2(Univ. of Arizona).

Comparisons.—Specimens from the Huachucas are typical of the race *C. l. arizonensis*. The type locality of this subspecies is within 45 miles.

Measurements.—Two males^{1, 2} are as follows: total length, 325, 325; tail, 125, 88; hind foot, 38, —; ear, 28, —; greatest length of skull, —, 63.4; condylobasal length, —, 59.9; basilar length, —, 52.6; greatest length nasals, 24.0, 23.6; least interorbital constriction, —, 11.9; postorbital constriction, 13.1, 14.0; palatine slits, 5.6, 4.0; palatilar length, 31.0, 31.0; alveolar length maxillary toothrow, 16.4, 16.9.

Remarks.—Prairie dogs occurred, at one time, on the alluvial fans of at least Ramsey and Brown canyons, but they were much more abundant out on the flats, away from the Mountains. On the flats 8 miles east of Ash Canyon there was a large colony. Extensive poisoning has now completely exterminated the prairie dog from the vicinity of the Mountains. We found that most of the residents of the Mountains, except for Roy Newman who provided us with our information, are unfamiliar with the prairie dog since it has been absent for so long. However, as late as 1938, Charles Vorhies observed and collected two prairie dogs 6 mi. SE Fort. In 1893, the prairie dog was abundant, for Price (in Allen, 1895:237) writes, "We saw about twenty, and, by the number of hillocks, estimated the colony to number about 200 individuals." Some prairie dogs were present along the western base of the Mountains, according to Stanley Young. "A small colony of these animals was found on a flat sandy 'draw' about six miles from the Fort . . ." in 1892, according to Fisher. Young informs us that some prairie dogs were present on the parade ground of the Fort as late as 1918.

The black-tailed prairie dog evidently did not hibernate in the Huachucas, for Price (*loc. cit.*) in writing about his experiences says, "A single specimen was shot January 28, on the plain at the base of the Huachuca Mountains. It was a warm day after a cold rain, and the animals were scratching out their burrows, and feeding on the dwarfed grass roots."

With prairie dogs so abundant here at one time, one wonders if the black-footed ferret (*Mustela nigripes*), a common predator of *Cynomys*, was present also. This ferret has been reported (Young and Halloran, 1952:251) as occurring about 150 miles to the north (Springerville).

Sciurus arizonensis huachuca Allen

ARIZONA GRAY SQUIRREL

Sciurus arizonensis huachuca Allen, Bull. Amer. Mus. Nat. Hist., 6: 349, 1894. Huachuca Mountains, Cochise Co., Arizona.

Records of occurrence.—Miller Canyon, 10¹; Carr Canyon Reef, 4²; Sunnyside, 1³.

Comparisons.—Our specimens, all of which must be regarded as topotypes, show considerable variation. Allen (1894:349) indicates that the upper surface is nearly uniform gray, showing merely a slight trace of the broad median dorsal area of fulvous. In the 10 animals judged to be adult, all taken in August, 3 are uniformly gray, with little fulvous; 4 have the broad fulvous area restricted to the posterior third of the back; and 3 have the fulvous area over the posterior half. The underside of the tail in one is almost entirely whitish; in one the central "fulvous area" on the underside of the tail is more grayish than reddish; in the others this area is fulvous or reddish-brown in varying degrees and in varying widths. Between the ears in 9 specimens there is varying, but slight, admixtures of fulvous in the gray; in one the area between the ears is entirely gray.

The skull is relatively narrower in the interorbital region and has a relatively broader rostrum, when compared to *S. a. arizonensis* and *S. a. catalinae*, as pointed out by Doutt (1931:272).

Measurements.—Three adult males^{1, 2} and the average, minimum, and maximum of 7 adult females^{1, 2, 3} are: total length, 492, 574, 522; 521.6 (496–542); tail, 236, 253, 263; 247.4(225–275); hind foot, 68, 74, 70; 70.4(64–76); ear from notch, 32, 34, 37; 34.0(32–36); basal length of skull, 50.4, 54.5, 55.3; 53.3(51.5–54.2); basilar length, 46.5, 48.5, 49.3; 48.1(46.6–49.0); palatal length (to premaxillary), 31.5, 32.8, 33.1; 32.4 (31.3–33.5); palatal length (to posterior end of anterior palatine slits), 19.9, 20.2, 20.6; 20.3(19.9–20.6); zygomatic breadth, 36.5, 36.9, 37.8; 36.6(35.5–37.9); least interorbital breadth, 20.7, 21.2, 22.8; 20.7(20.1–21.5); least postorbital width, 21.6, 20.9, 21.3; 20.6(20.1–21.5); width rostrum over anterior palatine slits, 12.4, 11.7, 11.5; 12.2(11.5–12.8); alveolar length premolar-molar series, 11.2, 11.0, 11.3; 11.3(11.1–11.5).

Remarks.—In 1949 and 1950, gray squirrels were observed by us in Miller, Carr, and Ramsey canyons, at Sunnyside on the west side, and D'Albini's (Cave Creek Canyon) on the south side. They certainly must have occurred in still other canyons. In 1893, Price (in Allen, 1895:245) found this squirrel "common . . . from the highest peaks to the base of the range" and Mearns's (1907:280) observations the same year were similar. Gray squirrels may be as abundant now as they were in 1893, but if such is the case, they are much more wary of humans. It would have taken much effort and time for us to have collected "a series of over 40" as Price did in a very short period of time.

In the Huachucas, the gray squirrels apparently preferred the canyon bottoms which were heavily wooded with walnut, sycamore, oak, and some pines. However, they were to be found in good numbers among heavy stands of pines and Douglas fir, as on the Carr Canyon Reef. The squirrels here were feeding on pine cones. The chief items of food for

most of the squirrels was the black walnut. Mearns (*loc. cit.*) found that in "July and August, 1893, it appeared to be feeding chiefly upon black walnuts, and was usually found near streams." Price said that during the summer of 1893, "I found it abundant in Ramsey Cañon, which that year had a good crop of walnuts. Often we would see two or three in one tree feeding on the partially ripe nuts." Several of our specimens have the fore feet stained black from the juices in the hulls of the walnut, and 3 also have the hair near the lips and on the throat and underparts stained brown. At D'Albini's Ranch gray squirrels moved down from Cave Creek Canyon each day to feed on the walnuts in the trees which shade the ranch house. The squirrels even came down on the ground in the yard to recover the walnuts. Dogs and human beings did not greatly disturb the animals as they did in other places, and these squirrels must surely have accustomed themselves to human beings. At dusk, these squirrels moved some distance through the intervening trees up canyon to their nests. At another place, two squirrels were observed feeding on acorns.

Gray squirrels were difficult to detect, in our experience, for they remained quiet when approached, and they frequently must have gone undetected. One squirrel was watched and in turn watched us for nearly a half hour, and during this time it gave no call and moved only slightly even though we remained nearly motionless. In one small section of about one-eighth mile along the bottom of Miller Canyon, gray squirrels were particularly abundant. A "colony" apparently was established here, for we took both young and adults. In August, 1950, we removed 4 from this small spot and observed 3 more. Why the squirrels were so much more numerous in this small section of a canyon which seemed much the same for at least a mile and a half could not be detected by us.

Gray squirrels in the Huachucas breed early, according to Price (*loc. cit.*) "for by the middle of July we obtained young, nearly full grown." Three of our specimens taken in August appear to be young of the year. One adult female was lactating. Either she was nursing these nearly full-grown young or a newborn litter which might represent the second of the summer.

One of our specimens has a sliver of a tooth in front of each fourth upper premolar, and this may represent a vestige of the "lost" Pm^3 .

We learned of a report of the introduction of eastern gray squirrels, *Sciurus carolinensis*, in the Huachucas near Sunnyside. Although several of our squirrels resemble eastern gray squirrels closely, none had the cranial and dental features of that species.

Thomomys

In a revision of the pocket gophers, *Thomomys*, of Arizona, Goldman

(1947) regarded 2 species and 4 subspecies as occurring in the Huachucas: *Thomomys umbrinus intermedius* Mearns, "near the summit of the Huachuca Mountains" (1947:36); *Thomomys umbrinus proximus* Burt and Campbell, "at Fort Huachuca" (1947:34); *Thomomys bottae modicus* Goldman, "east to Fort Huachuca" and "along the lower slopes of the Santa Rita and Huachuca Mountains," (1947:28); and *Thomomys bottae hueyi* Goldman, "at about 7,000 feet altitude in Ramsey Canyon and in the head of Miller Canyon in the Huachuca Mountains" (1947: 27). In an area of 6 miles by 12 miles, 2 species, 4 subspecies! It seemed advisable to us to check carefully this view that there could be 2 full species and 4 subspecies in such a small area.

The species *Thomomys umbrinus* and *Thomomys bottae* have been characterized by Goldman in his 1947 publication. If one considers all of the geographic variation that occurs within *T. umbrinus* and *T. bottae*, he will find that there are no truly diagnostic features between these 2 species. If the geographic area is restricted to southeastern Arizona, diagnostic features listed by Goldman include — for *T. umbrinus*: 1 pair pectoral mammae, blackish color along middorsal line, rostrum short and moderately broad, auditory meatus small, braincase smoothly rounded and with no conspicuous temporal ridges, zygomata slender; — for *T. bottae*: 2 pairs pectoral mammae, color on back variable, rostrum broad, auditory meatus moderate, braincase with temporal ridges, zygomata heavy.

Our material of *Thomomys umbrinus (intermedius)* and *Thomomys bottae* indicates that, of these features listed by Goldman, only the differences in the number of pairs of pectoral mammae and color on the back are diagnostic. Features and conditions of the rostra, zygomata, auditory meatuses, and ridging of the braincase are duplicable in either series. We have carefully looked for other cranial differences, but to no avail.

The number of pectoral mammae in 3 females of *T. umbrinus* is 1 pair; in 1 female of *T. bottae*, 2 pairs. We found it difficult or impossible to determine the numbers of pectoral mammae on other specimens, for in August, when we collected, gophers were not lactating. The number of pairs of pectoral mammae has questionable diagnostic value, in our minds. Within a subspecies and even within a population, individuals occur with 1 or 2 pairs of pectoral mammae. In 1 individual in the White Mountains, Arizona, 1 pectoral mamma occurred on 1 side, 2 on the other. Within 1 subspecies, Goldman (1947) says of *T. umbrinus proximus*, which should have 1 pair of pectoral mammae, "pectoral mammae, sometimes two pairs," and of *T. bottae collinus*, from the Chiricahuas, he says in "a few specimens . . . only one pair of pectoral mammae was found . . . but the number of these mammae proves to vary from normal

in some individuals." The race *chiricahuae*, regarded as *T. umbrinus* (with 1 pair of pectoral mammae), was placed by Goldman as a synonym of *T. bottae collinus*. In *T. bottae grahamensis*, from the Graham Mountains, our own investigations indicate that specimens within a population may have 1 or 2 pairs of pectoral mammae.

Dark coloration on the dorsum is the other diagnostic feature separating these 2 "species" in the Huachucas. Specimens from high in the Mountains have a uniformly blackish band extending along the back from the head to the rump. However, 3 specimens from 8400 feet on Carr Peak are similar in coloration to and cannot be detected from the series from 5000 feet at the mouth of Miller Canyon. Furthermore, specimens from high in the Graham Mountains have a blackish band and are as dark as those from high in the Huachucas. Yet Goldman regarded the Graham specimens as *T. bottae*. Specimens from high in the Chiricahua and Santa Catalina mountains are just as dark also, but they, too, are referred to *T. bottae*. We think that dark color is correlated, in some fashion, with altitude, and undoubtedly concomitant with other features, but is not a character worthy of specific rank.

Since the high-mountain, dark-colored gophers cannot consistently be distinguished from the foothill and valley gophers in any important characters, we deem it advisable to refer all the material to one species, for which the earliest name is *T. bottae*. By this we do not mean to imply that *T. umbrinus* is necessarily a synonym of *T. bottae*, for we have not studied gophers throughout the reported range of *umbrinus*. We do mean that in the Huachucas, and perhaps in all of southern Arizona, gophers regarded as *T. umbrinus* by Goldman (1947) are best referred to *T. bottae*.

In the Huachucas, the pocket gophers are of 3 types: a large, dark-colored type, taken high in the Mountains, probably above 8000 feet; a small, dark-colored type, taken near the northern end of the Mountains, and probably occurring principally between 5500 and 7500 feet; and a large, brightly colored type, occurring on the alluvial fans between 5000 and 5500 feet.

***Thomomys bottae intermedius* Mearns**

WESTERN POCKET GOPHER

Thomomys fulvus intermedius Mearns, Proc. U.S. Nat. Mus., 19:719, 1897. Summit Huachuca Mountains, 9000 ft., Cochise Co., Arizona.

Records of occurrence.—NW slope Carr Peak, 8400 ft., 27.

Comparisons.—This is a large-bodied, long-tailed, dark-colored form. The back and sides are heavily and uniformly overlaid with black, with the blackish extending down the sides so far that the bright color, which

is between Cinnamon and Orange-Cinnamon, is apparent only in limited amount above the lateral line. The dark auricular patch is hardly discernible, for it is nearly the same color as the back. The underparts are usually washed with ochraceous or buffy and are about the same color as the sides. Three specimens are less heavily overlaid with black and are near Sayal Brown in color. These 3 are very near, in color, to specimens of *T. b. hueyi* from the alluvial fans.

Measurements indicate that *intermedius*, high in the Mountains, is as large as specimens of *T. b. hueyi* from the alluvial fans. Some comparative measurements for males of *intermedius* and *hueyi* are: body-length, 145.9, 143.8; tail, 62.8, 68.8; length of skull, 37.3, 37.6; zygomatic breadth, 22.7, 22.1; length of nasals, 12.9, 12.8. Color must be relied upon for distinguishing *intermedius* from *hueyi*. For comparisons with the gophers which occur at the north end of the Huachucas, see the account of *T. b. proximus*.

Measurements.—Fifteen adult males and 6 adult females give average, minimum, and maximum measurements: total length, 208.7(190–220), 202.7(190–215); tail, 62.8(52–71), 64.2(59–68); hind foot, 28.4(26–31), 27.8(25–30); ear from notch, 6.2(5–7), 6.2(6–7); greatest length skull, from supraoccipital to anterior face incisors, 37.3(35.2–39.2), 35.4(33.5–37.1); basilar length, 32.3(30.3–33.8), 30.2(29.0–32.2); greatest zygomatic breadth, 22.7(21.2–24.1), 21.7(20.3–22.3); least interorbital constriction, 6.6(6.1–6.8), 6.4(6.1–6.8); mastoidal breadth, 18.9(17.7–20.3), 18.4(17.5–19.4); length nasals, 12.9(11.2–14.7), 12.0(11.1–13.5); breadth rostrum, at premaxilla-maxilla suture, 7.8(7.0–8.8), 7.5(6.8–8.1); length rostrum, from tip nasals to anterolateral tip lacrimal, 15.8(14.9–17.0), 14.7(13.9–15.6); alveolar length maxillary toothrow, 7.9(7.5–8.2), 7.7(7.3–8.1); extension premaxilla posterior to nasals, 2.2(1.8–3.0), 1.9(1.5–2.4).

Remarks.—*T. bottae intermedius* is a large, dark-colored race that occurs high in the Huachucas. We encountered this subspecies only on the north side of Carr Peak, near the summit. Here there was an opening in the coniferous forest, which probably was the result of a much earlier fire. *T. b. intermedius* may occur in similar clearings high in the Mountains, but these spots are relatively few and we suspect there are few colonies of this race. There may be a small colony in the saddle at about 9000 feet between Miller and Carr peaks and some near the summit of Miller Peak.

On Carr Peak, pocket gophers occurred in an opening that in August was nearly knee-high with various perennials and annuals. The commonest plant was a sunflower type, *Helianthella quinquenervis*, together with brachen, *Verbena*, brome grass, June grass (*Collaria*), *Monarda astromontana*, *Xanthocephalum wrightii*, and *Pomelania*. The surrounding and encroaching forest consisted of white fir, Douglas fir, Chihuahua

pine, Apache pine, Mexican white pine, Gambel oak, mountain mahogany, and aspen. The soil was exceedingly rocky and difficult to dig in many places, even with a trowel. The rocks were up to 5 inches in diameter.

Burrows and workings were abundant in this clearing. Some burrows were very near the surface of the ground (within 2 inches); others were much deeper. Those near the surface may represent feeding runways; the others, permanent home or nest burrows. Frequently, the gophers close the entrances of their burrows with a rolled-up plug of sunflower leaves. In other burrows, plants were present that indicated these gophers frequently came out on the surface of the ground to feed. Along almost any burrow, cuttings from $\frac{3}{4}$ to 2 inches in length of the sunflower could be found. Within 3 feet of one surface mound, a cache of sunflower leaves only, amounting to about 1 pint, was uncovered.

Following a heavy rain, gophers immediately started to throw up mounds. Several of these new mounds were opened and traps put in. The first gopher was caught within 20 minutes of setting the trap. In another case, a gopher buried the trap with dirt. While opening the hole to reset the trap, Hoffmeister could clearly hear the gopher within. It was judged to be within 8 feet of the open burrow and apparently push-



FIG. 24. Northwest slope of Carr Peak, 8400 feet, at a clearing in fir, pines, and aspen, where *Thomomys bottae intermedius* were numerous. This spot might be regarded as the type locality of this subspecies. The "meadow" is grown up with a sunflower, brachen, and brome grass. Photographed August, 1950, by R. G. Van Gelder.

ing rocks along the burrow. Within 10 minutes after resetting this trap, the animal was caught. During heavy rains some of the burrows near the surface of the ground must wash out, judging from some small, narrow depressions on the sloping surface of the clearing.

Thomomys bottae proximus Burt and Campbell
WESTERN POCKET GOPHER

Thomomys burti proximus Burt and Campbell, Jour. Mamm., 15:151, 1934. Old Parker Ranch, 4800 feet, west slope Santa Rita Mountains, Pima Co., Arizona.

Records of occurrence.—Near entrance to Canelo Mine, Canelo Gate, 5¹; 4 mi. W, 1 mi. N Fort, 1²; government cabin, head of Garden Canyon, 1³.

Comparisons.—The specimens listed above are small, dark-colored individuals. The color is between Ochraceous-Tawny and Tawny, overlaid with black in a relatively narrow stripe near the middorsal line. The black does not extend as far down the sides as in *intermedius* but is more intense and pronounced along the midline than in *intermedius*. The underparts are slightly darker than in *intermedius*, possibly because there is less buffy or ochraceous. In external measurements, specimens are from 5 to 10 per cent smaller than *intermedius* and the skull is smaller. This is noticeable in the maxillary teeth, where the toothrow is not only shorter, but the individual teeth are narrower.

In size of skull, specimens from the Huachucas are very near *T. b. proximus* as described by Burt and Campbell from the Santa Ritas. In color they are not far from Tawny-Olive (apparently this is what the authors referred to when they said "olive-tawny"), but they have a dark dorsal stripe, whereas *proximus* reportedly has none. In color, the specimens do not approach Wood Brown as in *T. b. modicus*, and are much darker than other races from nearby.

The specimens from the northern end of the Huachucas, between about 5500 and 7500 feet, are most similar to *proximus* in external and cranial size, but the coloration appears to be distinctive. Some persons may choose to refer these specimens to a new race, but surely there are enough names available for pocket gophers in southeastern Arizona. When the pocket gophers from this area are critically studied and revised, it may be necessary to refer these specimens to another named form.

The specimen from 4 mi. W, 1 mi. N Fort Huachuca has the dark middorsal stripe much less intense than in other specimens, and in this regard is intermediate between the color of *proximus* and *hueyi*, or *intermedius* and *hueyi*. This specimen is taken from the lowest elevation of any of the specimens here referred to *proximus*.

One specimen from near Canelo Gate is exceedingly black along a broad band which covers the back but not the sides. The entire underparts are nearly as dark as the back. This color apparently represents a mutation.

Measurements.—One nearly adult male³ and 4 adult females^{1, 2} give the following measurements: total length, 170, 190, —, 181, 185; tail, 57, 62, —, 58, 67; hind foot, 25, 26, —, 25, 27; ear from notch, 6, 6, 6, 6, 7; greatest length skull, 30.9, 36.1, 33.4, 33.3, 33.6; basilar length, 25.9, 31.1, 28.1, 27.7, 28.8; zygomatic breadth, 19.0, 21.0, 19.9, 19.4, 19.7; least interorbital constriction, 6.5, 6.8, 6.6, 6.6, 6.5; mastoidal breadth, 15.7, 17.6, 16.6, 17.1, 16.5; length nasals, 9.2, 11.2, 10.4, 10.8, 10.7; breadth rostrum, 6.4, 7.2, 6.8, 6.4, 6.8; length rostrum, 12.1, 13.7, 13.0, 12.7, 13.1; maxillary toothrow, 6.4, 7.4, 6.9, 6.9, 7.0; posterior extension premaxillae, 1.5, 1.4, 1.7, 1.4, 1.5. Cranial measurements are taken as described in account of *T. b. intermedius*.

Remarks.—Near Canelo Gate, these gophers occurred in rocky soil where there was mountain mahogany, sumac, agave, juniper, Emory

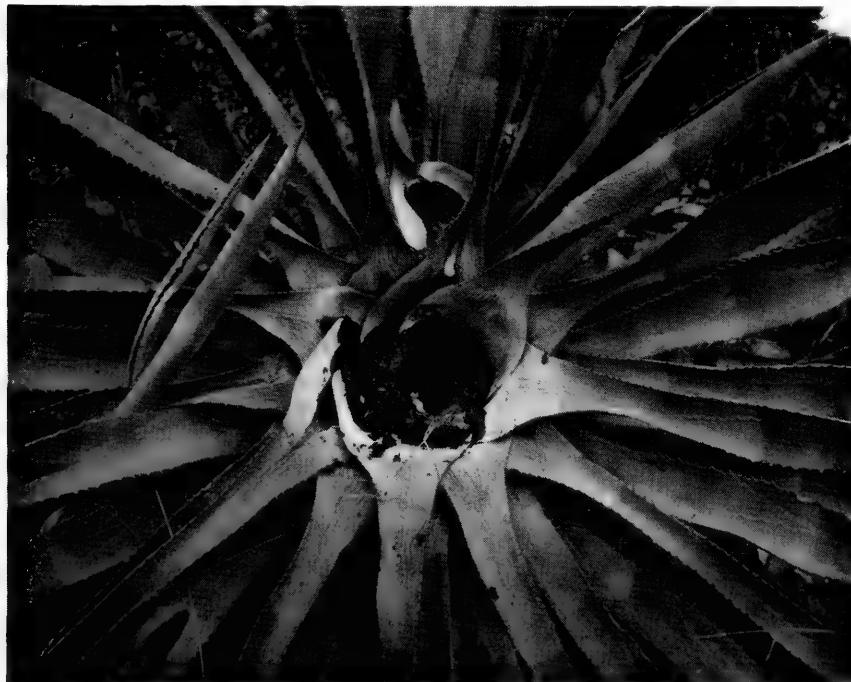


FIG. 25. Agave plant tunneled through by pocket gopher, *Thomomys bottae proximus*, at Canelo Gate west of Fort Huachuca. The trap set in the exposed tunnel produced a specimen. Photographed August, 1950, by R. G. Van Gelder.

oak, and some grasses, including *Andropogon*. At the head of Garden Canyon where one specimen was taken, there was considerable grass in a clearing among pines and Douglas fir.

Numerous *Agave* plants throughout the Huachucas have dead leaves at the top but green leaves near the base. Near Canelo Gate, we happened to break out the dead top of an *Agave*, only to discover that a gopher had eaten the entire core of the stalk and plugged the hole with dirt. We opened this hole, set a trap (see Fig. 25), and caught a *T. bottae proximus*. Although only part of this plant was dead, all would have died shortly. We suspect that the numerous dead agaves near this spot may have been attacked in this fashion by gophers. Borell and Bryant (1942:22) noted that *Thomomys bottae* in the Big Bend of Texas "were most numerous about *Agave lecheguilla* . . . parts of which are often undermined and killed."

Thomomys bottae hueyi Goldman

WESTERN POCKET GOPHER

Thomomys bottae hueyi Goldman, Jour. Wash. Acad. Sci., 28:340, 1938. Spud Rock Ranger Station, 7400 ft., Rincon Mountains, Pima Co., Arizona.

Records of occurrence.—Mouth of Miller Canyon, 45¹; mouth of Ramsey Canyon, 1; Carr Canyon, 7.

Comparisons.—Specimens referred to *T. b. hueyi* in the Huachucas are large sized and brightly colored. In most specimens the color is between Cinnamon and Pinkish Cinnamon. A few are nearly as bright as Ochraceous-Orange. There is a faint overlay of blackish, and this is slightly more concentrated along the middorsal line, with the result that there is a perceptible, but faint, narrow dark stripe. The nose is blackish, and this coloration extends upward to between the eyes. The underparts are usually washed with buffy or ochraceous, and this wash is more intense in some. The dark auricular patch is conspicuous.

In size, our specimens could be referred to *T. b. modicus*, *T. b. extenuatus*, or *T. b. hueyi*. In coloration, they are more reddish and brighter than *modicus*, and less pale, brighter, and more reddish than *extenuatus*, judging from Goldman's original descriptions. In color, they seem to be nearest *hueyi*, and may even be slightly brighter than this subspecies.

In 2 specimens, the dark middorsal line is quite dark and concentrated, and shows approach to specimens of *proximus* from Canelo Gate. We would have difficulty distinguishing these 2 from *proximus* on color alone.

Measurements.—Ten adult males¹ and 29 adult females¹ give the following average, minimum, and maximum measurements: total length,

212.6(195–230), 198.4(181–222); tail, 68.8(60–82), 67.3(62–74); hind foot, 29.1(26–31), 28.4(26–31); ear from notch, 6.6(6–8), 6.6(6–8); greatest length skull, 37.6(34.8–38.4), 36.2(33.8–38.8); basilar length, 32.1(29.3–36.3), 30.7(28.6–33.0); zygomatic breadth, 22.1(20.4–24.5), 21.5(19.8–23.4); least interorbital constriction, 6.6(6.3–7.1), 6.6(6.1–6.9); mastoidal breadth, 18.6(17.3–19.4), 18.4(17.4–19.3); length nasals, 12.8(11.6–15.2), 12.1(10.9–13.3); breadth rostrum, 7.4(6.9–8.8), 7.3(6.2–8.1); length rostrum, 15.3(14.1–18.2), 14.6(13.1–15.9); maxillary tooth-row, 8.1(7.5–8.6), 7.9(7.4–8.6); posterior extension premaxillae, 1.7(1.4–2.3), 1.2(0–2.3). Methods of taking some cranial measurements are explained in the account of *T. b. intermedius*.

Remarks.—Specimens referred to this subspecies occurred on the higher portions of the alluvial fans, but chiefly below the oak belt. They were numerous on that portion of the fan where there was a fairly heavy stand of grass, but above the "*Dipodomys*-zone." Probably in this intermediate zone, along the lower edge of the oaks, it was the most abundant mammal. This gopher occurs in this same situation all along the eastern slope of the Huachucas, in all probability, but whether it occurs in this zone on the western side is not known.

No specimens contained embryos in August.

***Perognathus flavus flavus* Baird**

SILKY POCKET MOUSE

Perognatus [sic] *flavus* Baird, Proc. Acad. Nat. Sci. Phila., 7:332, 1855. El Paso, El Paso Co., Texas.

Records of occurrence.—5 mi. S Fort Huachuca, 2; mouth of Carr Canyon, 7; Nicksville, 2; mouth of Miller Canyon, 9; mouth of Ramsey Canyon, 1(skull only); mouth of Montezuma Canyon, 7. Additional records: Fort Huachuca, 41; Tanner Canyon, 4(U.S. Nat. Mus., see Osgood, 1900:24).

Comparisons.—Our specimens are small, both externally and cranially, and in this regard are nearer *P. f. flavus* than *P. f. bimaculatus*. In coloration, they are Pinkish Buff with some admixture of black and in general fit Osgood's (1900:23) description of this form.

Measurements.—Average, minimum, and maximum measurements of 8 adult males and 7 adult females, from various localities listed above, are, respectively: total length, 103.0(100–107), 106.3(103–111); tail, 45.8(42–48), 49.7(49–51); hind foot, 16.1(15–18), 16.1(12–18); ear from notch, 6.4(5–7), 8.1(6–12); occipitonasal length, 20.2(20.0–20.3), 20.0(19.6–20.2); frontonasal length, 13.1(13.0–13.2), 12.8(12.2–13.2); mastoidal breadth, 11.7(11.4–12.2), 11.7(11.3–11.9); length of bulla, 8.0(7.9–8.0), 7.7(7.3–8.1); interorbital breadth, 4.7(4.4–5.1), 4.6(4.3–4.8); alve-

olar length upper molariform teeth, 2.9(2.8-2.9), 3.0(2.8-3.1). Measurements were made as defined by Hall (1946:357).

Remarks.—The silky pocket mouse occurs the farthest or highest up the alluvial fans of any of the 3 *Perognathus* that occur together in the Huachucas — *P. flavus*, *P. hispidus*, and *P. penicillatus*. *Perognathus flavus* is to be found up the grassy bajadas to near the edge of the oak woodland or woodland chaparral. Here, it is the only *Perognathus*. Below this level, all 3 species will occur together, as we encountered in the grama grass-*Senecio* association in Miller, Carr, and Montezuma canyons. Below this association, in the mesquite grassland, *Perognathus flavus* may soon drop out, for in our trapping far out in the mouth of Ramsey Canyon, we obtained none.

Silky pocket mice can be found scurrying about, across the sand between clumps of grass or across the road, shortly after dark. They run with great rapidity between areas of "protective" cover, but once cover is reached, they tend to "freeze" in the grass or bushes. These pocket mice could be shot as they ran across openings or caught as they came to rest under bushes. All predators must find them an easy source of food. Great horned owls prey upon them heavily. An analysis of items in approximately 24 owl pellets from the mouth of Garden Canyon indicates that 47 per cent of the mammals taken are *Perognathus flavus*. The next most often taken species was only 14 per cent of the food items.

Of the 24 mature specimens saved, 9 are females and none was preg-



FIG. 26. Silky pocket mouse, *Perognathus flavus flavus*, mouth of Miller Canyon, Huachuca Mountains. Photographed August, 1950, by W. W. Goodpaster.

nant in August. Four of the specimens are young and are probably only a few weeks old. One specimen had seeds in its cheek pouches from 2 species of crotons, *Croton texensis* and *C. corymbulosus*.

Perognathus hispidus conditi Allen

HISPID POCKET MOUSE

Perognathus conditi Allen, Bull. Amer. Mus. Nat. Hist., 6:318, 1894.

San Bernardino Ranch, Cochise Co., Arizona.

Records of occurrence.—Mouth of Ramsey Canyon, 4; mouth of Carr Canyon, 9; mouth of Miller Canyon, 8; mouth of Montezuma Canyon, 3. Additional record: "Fort Huachuca," 1 (U.S. Nat. Mus., see Osgood, 1900:45).

Comparisons.—Specimens of *Perognathus hispidus* from southeastern Arizona have currently (Glass, 1947:178) been referred to the subspecies *paradoxus* (type locality, Banner, Trego Co., Kansas). Specimens from the Huachuca Mountains are smaller than the average for *paradoxus*, and differ in other respects. At the type locality of *paradoxus*, the average total length is 222 mm., and Glass (*loc. cit.*) considered as diagnostic that the total length averaged more than 200 mm. In the Huachucas, the average total length is only 192.7 mm., and only 2 individuals measure more than 200 mm. In contrast with other diagnostic features of *paradoxus*, according to Glass, the hind foot averages 24.7 mm. in length rather than "about 25 mm."; the occipitonasal length averages 29.7 mm. rather than "more than 30 mm.;" mastoidal breadth averages 14.7 rather than "more than 15 mm." The coloration of our specimens, all taken in August, is Light Ochraceous-Buff along the lateral line.

In smallness of size, we suspect that specimens from southeastern Arizona show closer relationship to *P. h. hispidus* than to *P. h. paradoxus*. However, our Huachucan material differs from *P. h. hispidus*, according to Glass (*op. cit.*), in that the interparietal is broader, rather than narrower, than the interorbital width.

Since the specimens from southeastern Arizona possess a combination of distinctive features, we refer them to the subspecies *conditi*. We suspect that all specimens from west of eastern New Mexico and including Chihuahua are referable to this subspecies.

Measurements.—Ten adult males, from various localities in the Huachucas, give average, minimum, and maximum measurements as follows: total length, 192.7(174-205); tail, 96.6(88-106); hind foot, 24.7(23-26); ear from notch, 12.0(11-13); occipitonasal length, 29.7(28.9-30.6); frontonasal length, 19.9(19.4-20.8); mastoidal breadth, 14.7(14.1-15.4); length of bulla, 8.4(8.1-9.0); interorbital breadth, 7.0(6.8-7.2); width interparietal, 7.6(7.1-8.1); alveolar length upper molariform teeth, 3.9 (3.7-4.2).

Remarks.—*Perognathus hispidus* lives on the alluvial fans where the grasses and weeds are dense. In such localities there are few agave, mesquite, and prickly pear. The soil is loose and gravelly. *P. hispidus* are found in some places with *P. flavus* and *P. penicillatus*, and in no places did we find that it was not associated with one or the other, if not both, of these species.

Five mature females contained no embryos in August.

***Perognathus penicillatus pricei* Allen**

DESERT POCKET MOUSE

Perognathus pricei Allen, Bull. Amer. Mus. Nat. Hist., 6:318, 1894.
Oposura, Sonora, Mexico.

Perognathus penicillatus pricei, Osgood, No. Amer. Fauna, 18:47,
1900.

Records of occurrence.—7 mi. ESE Fort Huachuca, 9; 8 mi. SE Fort Huachuca, 6; mouth of Ramsey Canyon, 6; mouth of Brown Canyon, 1; mouth of Carr Canyon, 2; mouth of Miller Canyon, 14; mouth of Montezuma Canyon, 10. Additional records: Fort Huachuca, 1 (U.S. Nat. Mus., see Osgood, 1900:48).

Comparisons.—Our specimens are referred to *P. p. pricei*, but they might well be referred to *P. p. eremicus* (type locality, Fort Hancock, El Paso Co., Texas) or *P. p. penicillatus* (type locality, San Francisco Mt., Coconino Co., Ariz.). Osgood (1900:48-49) regards one specimen from Fort Huachuca as *pricei* and 27 from San Bernardino Ranch, only 65 miles away, as *eremicus*. Because of the shortness of the nasals in our specimens (9.1 or 9.2 mm.), they are considered to be *P. p. pricei*.

Measurements.—Average, minimum, and maximum measurements of 10 adult males and 10 adult females, from various localities listed above, are, respectively: total length, 169.2(161-180), 168.3(154-180); tail, 90.3 (86-101), 90.7(82-97); hind foot, 23.3(22-25), 22.9(21-25); ear from notch, 8.9(8-9.5), 8.7(6.5-10); occipitonasal length, 25.0(24.3-25.8), 24.7(23.7-26.0); frontonasal length, 16.9(16.2-17.3), 16.7(16.2-17.4); mastoidal breadth, 12.9(12.3-13.3), 12.6(12.1-13.3); length of bulla, 7.8 (7.5-8.0), 7.7(7.5-8.0); interorbital breadth, 6.2(5.8-6.7), 6.2(5.9-6.5); alveolar length upper molariform teeth, 3.3(3.2-3.5), 3.3(3.1-3.6); length of nasals (mid-line), 9.2(8.6-10.1), 9.1(8.5-9.5). Measurements were made as defined by Hall (1946:357).

Remarks.—*Perognathus penicillatus* is found in association with all 3 species of *Dipodomys*, but it also occurs slightly above the zone of *Dipodomys*. In most instances, *Perognathus penicillatus* and *Perognathus hispidus* can be taken together.

The desert pocket mouse was abundant at the lower edge of the al-

luvial fans where there was mesquite, yucca, grama, prickly-poppy, cotton-top, drop-seed, giant hyssop, and associated plants. *P. penicillatus* also occurred well up the alluvial fans.

Even though desert pocket mice were abundant, only 3 individuals were recovered in 43 food items in the pellets of great horned owls. They were as frequently consumed by horned owls as any other species except *Perognathus flavus*.

Of 25 mature females, none contained embryos in August.

Perognathus intermedius intermedius Merriam

ROCK POCKET MOUSE

Perognathus intermedius Merriam, No. Amer. Fauna, 1:18, 1889.
Mud Spring, Mohave Co., Arizona.

Records of occurrence.—8 mi. W Fort Huachuca, 8¹. Additional record: "Fort Huachuca," 1 (U.S. Nat. Mus., see Osgood, 1900:53).

Comparisons.—Most of our specimens of *P. intermedius* are as pale, or paler, than *P. penicillatus*, and the rump spines are so weakly developed as to be little different than in *penicillatus*.

Measurements.—Seven adult males¹, average, minimum, and maximum: total length, 176.4(166–204); tail, 96.1(93–100); hind foot, 21.9 (20–23); ear from notch, 8.1(7–9); occipitonasal length, 24.8(24.2–25.1); frontonasal length, 16.5(16.2–16.9); mastoidal breadth, 13.0(12.5–13.5); length of bulla, 7.9(7.7–8.2); interorbital breadth, 6.4(6.2–6.7); alveolar length upper molariform teeth, 3.4(3.2–3.5).

Remarks.—*Perognathus intermedius* was encountered on fairly steep slopes, with rocky soil and exposed rocky ledges, that had a sparse shrubby cover. In such areas, there may be sumac, mountain mahogany, some agave and scrub oak. The rock rattlesnake, *Crotalus lepidus klawberi*, is abundant here.

Although we encountered *Perognathus intermedius* only on the rocky slopes by Canelo Cave, the species undoubtedly occurs in similar situations in other parts of the Mountains.

Perognathus intermedius and *Perognathus penicillatus* are very similar, morphologically, in the Huachucas, yet they are very different in their ecological requirements. This is in contrast with *Perognathus flavus*, *P. hispidus*, and *P. penicillatus* which are so similar in ecological requirements here in the Huachucas, but so different morphologically.

Dipodomys ordii ordii Woodhouse

ORD KANGAROO RAT

Dipodomys ordii Woodhouse, Proc. Acad. Nat. Sci. Phila., 6:224, 1853. El Paso, El Paso Co., Texas.

Records of occurrence.—Mouth of Montezuma Canyon, 23; mouth of Ramsey Canyon, 3; flats 8 mi. SE Fort, 2; mouth of Garden Canyon, 1.

Comparisons.—Our material seems best referred to *D. o. ordii*. We are aware of the fact that in revising *Dipodomys ordii*, Setzer (1949:531) regarded specimens from Cananea, Sonora, only 30 miles from where most of our specimens were taken, as part of an apparently undescribed race. The material from the Huachucas does not fit his characterization of this unnamed form. In the Huachucas, the body is even smaller in size rather than larger than in *D. o. ordii*; the interorbital width is the same as in *ordii* rather than wider; the skull is of the same length rather than longer; the breadth across the bullae is slightly less than in *ordii* rather than greater. Since topotypes of *D. o. ordii* are not available, comparisons of color of pelage cannot be made.

In general, our material matches *D. o. ordii* more closely than any named form or the unnamed form characterized by Setzer, so we refer them to *D. o. ordii*.

Measurements.—Sixteen adult males and 8 adult females give the following average, minimum, and maximum measurements (taken after Setzer, 1949): total length, 232.1(207–257), 237.0(230–243); tail, 129.3 (106–144), 133.9(129–140); hind foot, 38.5(37–42), 38.8(37–41); ear from notch, 13.1(12–14), 13.0(12–14); greatest length skull, 37.3(35.3–39.3), 37.4(36.5–38.6); greatest breadth across bullae, 23.7(22.4–25.8), 23.6(22.5–24.5); breadth across maxillary arches, 20.2(18.6–22.2), 20.0 (19.3–21.2); width of rostrum, 3.7(3.4–4.2), 3.6(3.2–4.0); length of nasals, 13.2(12.4–13.9), 13.5(12.6–14.1); least interorbital width, 12.7(11.5–14.2), 12.6(11.8–13.3); basilar length, 23.2(21.5–24.5), 23.1(22.2–24.1).

Remarks.—On the alluvial fans, 3 species of *Dipodomys* (*ordii*, *merriami*, *spectabilis*) are found but *Dipodomys ordii* occurs slightly farther up the fans than the other 2 species. The 2 species which are most similar morphologically, *Dipodomys merriami* and *D. ordii*, were taken together at 4 localities and both had nearly identical ecological niches as far as we could tell. *D. ordii* occurs among the short grass of the alluvial fans, especially where there are some mesquites and yuccas, for these furnish shelter for dens and refuges in which the rats dart when disturbed while foraging.

Ord kangaroo rats were frequently encountered running across roads at night. Sometimes they could be "held" in the beam of a light and approached so closely that it was not feasible to shoot them even with .22 shot-shells.

Owls were often seen where kangaroo rats were abundant. In great horned owl pellets from Garden Canyon, 6 *Dipodomys* (either *ordii* or *merriami*) were included among the 43 identifiable remains. These rats also provide prey for coyotes and numerous snakes.

Two of 11 mature females taken in August contained 2 and 3 embryos, respectively. These must represent a second or third litter for the summer. One wonders if rats born late in August will be fully enough developed to prepare for hibernation, if these rats do hibernate here.

Dipodomys merriami merriami Mearns

MERRIAM KANGAROO RAT

Dipodomys merriami Mearns, Bull. Amer. Mus. Nat. Hist., 2:290, 1890. New River, between Phoenix and Prescott, Maricopa Co., Arizona.

Records of occurrence.—Mouth of Montezuma Canyon, 4¹; mouth of Ramsey Canyon, 1; mouth of Garden Canyon, 1; flats 8 mi. SE Fort, 14²; flats 7 mi. ESE Fort, 9³; 10 mi. SE Fort, 1.

Comparisons.—Specimens of *D. merriami* from the Huachucas are, in general, dark colored, and in this respect are similar to Swarth's (1929: 356) *D. m. olivaceus*. However, we follow Benson (1934:182-183) in ascribing a wide range of variation in color to *D. m. merriami*, with our specimens and those on which the name *olivaceus* was based near the darker end of the scale. Our series of adults averages smaller than topotypes of *D. m. merriami* in tail and total length and greater in hind foot length; the skull averages slightly larger in all measurements. *D. m. olivaceus* was supposedly characterized by a slightly larger skull. It will be necessary to study the variation in cranial features in this species throughout Arizona to determine what variation is worthy of subspecific rank. Our specimens appear less reddish than *D. m. regillus*.

Measurements.—Seven adult males^{2, 3} and 8 adult females¹⁻³ give the following average, minimum, and maximum measurements: total length, 243.3(233-259), 235.6(222-249); tail, 143.1(131-158), 137.4(130-151); hind foot, 38.7(36-40), 38.9(37-43); ear from notch, 14.3(12-19), 13.5 (12-16); greatest length skull, 37.0(36.3-38.0), 36.5(35.2-37.7); greatest breadth across bullae, 23.5(22.9-24.4), 23.1(22.0-24.0); greatest breadth across maxillaries, 20.4(19.1-21.7), 20.1(19.3-21.3); width rostrum, 3.4 (3.2-3.7), 3.2(2.9-3.4); length nasals, 13.7(13.5-14.0), 13.5(13.0-14.3); least interorbital width, 13.3(12.7-13.5), 13.2(12.6-14.0); basilar length, 23.1(22.5-23.9), 22.6(21.4-23.3).

Remarks.—*Dipodomys merriami* occurs in much the same habitat as *D. ordii*, but is more abundant (and *D. ordii* less abundant) on the flats southeast of the Fort, where the short grass is less thick and mesquite and white-thorn more abundant.

Merriam kangaroo rats were abundant along roads at night, as were *D. ordii*. The larger banner-tailed kangaroo rat (*D. spectabilis*) was never encountered along the roads.

One of 18 mature females collected in August contained 2 nearly full-term embryos.

Dipodomys spectabilis spectabilis Merriam

BANNER-TAILED KANGAROO RAT

Dipodomys spectabilis Merriam, No. Amer. Fauna, 4:46, 1890. Dos Cabezas, Cochise Co., Arizona.

Records of occurrence.—Mouth of Montezuma Canyon, 29; 7 mi. ESE Fort, 7; 8 mi. SE Fort, 1.

Comparisons.—Specimens of *Dipodomys spectabilis* from the Huachucas are within 65 miles of the type locality (Dos Cabezas) of *D. s. spectabilis* and 40 miles of *D. s. perblandus* (Calabasas, Santa Cruz Co., Arizona). Judging from Goldman's (1933:466) description of *perblandus*, our Huachucan material seems referable not to that race but to *D. s. spectabilis*. Our specimens are larger in all external measurements, especially hind foot (54 vs. 48 mm.), than in *perblandus*, and in this regard are similar to *spectabilis*. The skull is larger than in *perblandus*, as shown in the *Measurements*, the maxillary toothrow is longer (6.2 vs. 5.2 mm.), and the supraoccipital is more constricted (1.9 vs. 2.3 mm.) between the mastoids. All of these features are more nearly as in *spectabilis*. Without topotypes of *perblandus*, we cannot evaluate the features of color. It appears, however, that material from the Huachucas is "typical" *D. s. spectabilis* and does not suggest intergradation with *D. s. perblandus*.

Measurements.—Eleven adult males and 13 adult females give average, minimum, and maximum measurements as follows: total length, 339.8(322–352), 337.8(323–358); tail, 199.5(185–214), 193.8(178–203); hind foot, 53.5(52–56), 53.8(51–56); ear from notch, 17.2(15–21), 17.0 (15–19); greatest length skull, 46.1(45.3–46.8), 45.9(44.1–47.5); greatest breadth across bullae, 29.5(28.5–30.6), 29.3(28.0–30.4); breadth across maxillary arches, 26.4(25.5–27.3), 26.2(24.6–27.5); width rostrum, 4.8 (4.5–5.3), 4.9(4.5–5.2); length nasals, 16.5(15.7–17.1), 16.6(15.7–17.3); least interorbital width, 15.7(15.0–16.5), 15.3(14.3–16.3); basilar length, 30.1(29.0–31.3), 30.6(29.0–31.2).

Remarks.—In the Huachucas, banner-tailed kangaroo rats, *D. spectabilis*, are found at the base of the alluvial fans, or along their lower edge, and from there farther out into the desert. In the mouth of Montezuma Canyon, *D. spectabilis* must reach the upper zonal limits of their distribution at 5000 feet elevation. They seem to prefer more open grassland and fewer mesquites than *D. ordii* or *D. merriami* in the Huachucas. In foraging at night, *D. spectabilis* probably take refuge under bushes less

often than the other kinds of kangaroo rats, yet we never recovered any remains of *D. spectabilis* in owl pellets.

Banner-tailed kangaroo rats do not inhabit all of the large, rounded dens they have constructed. Their presence in the mound can be determined, in our experience, in the following fashion. Place one's ear by an entrance hole, and with a hand or some tool, pound heavily on the top of the mound. If the kangaroo rat is present, it will respond with a "growl" or "thump" somewhat like the rumble of distant thunder. The noise is probably made by the tapping of the hind feet; the underground tunnel gives the tap a reverberating "thump" sound.

Once the presence of the animal was established, a trap was placed in the most used runway. Rat traps are ineffective in catching *D. spectabilis*, because almost invariably the traps will be covered with sand so as not to function properly. The animals themselves must kick the sand on the traps as a protective measure, as pointed out for *D. deserti* by Benson (1935:67). A very small percentage of our *D. spectabilis* was taken in rat traps. Far more effective was the use of steel traps, size 0 or size 1. These traps were set in the same fashion that a set would be made for a carnivore. The "steel" was buried flush with the surface, and the trap including the pan was completely covered with sand. Oatmeal was then sprinkled on the ground over the buried trap. In these sets, rats are usually caught by the hind legs and are alive when the trap is visited. On one occasion, 12 steel sets produced 9 bannertails in one night. Another effective way to secure these rats is to put a burning "fusee" or flare in an entrance hole. Probably both the hissing noise and the dense smoke are effective in driving the rat out where it can be caught. This works best at night. In the daytime, the chamber where the rat is resting may be plugged off, and the smoke and fumes may not reach and disturb the animal.

Bannertails were seldom seen at night, while *D. ordii* and *D. merriami* may readily be seen. Bannertails tended to move rapidly along the runways radiating out from and interconnecting the mounds. As soon as the rays of the flashlight fell upon them, they moved toward the nearest entrance of the den.

Thirteen mature females were without embryos in August. Vorhies and Taylor (1922:17) recovered breeding females in January, and indicate that breeding extends through August. Nearly all of the adult specimens (26 out of 34) were undergoing a molt in August.

Snakes probably prey heavily upon bannertails. We caught 2 red racers (*Masticophis flagellum piceus*) at burrow entrances in Montezuma Canyon. *Crotalus* and *Pituophis* probably feed on these rats also.

Onychomys leucogaster ruidosae Stone and Rehn

NORTHERN GRASSHOPPER MOUSE

Onychomys ruidosae Stone and Rehn, Proc. Acad. Nat. Sci. Phila., 1903:22, 1903. Hale's Ranch, Ruidoso, Lincoln Co., New Mexico.

Onychomys leucogaster ruidosae, Hollister, Proc. Biol. Soc. Wash., 26:216, 1913.

Records of occurrence.—Mouth of Ramsey Canyon, 5¹; mouth of Miller Canyon, 1²; 7 mi. ESE Fort, 1; mouth of Montezuma Canyon, 1.

Comparisons.—Specimens from the Huachucas are smaller and with shorter tails than in some *O. l. ruidosae* and the skulls are broader across the zygomatica but narrower through the braincase. These differences may represent the extremes in a series of gradual changes at the end of a cline.

Measurements.—Three adult males, with worn teeth and adult pelage, give the following measurements: total length, 156¹, 147¹, 145²; tail, 46, 49, 33; hind foot, 22, 23, 20; ear from notch, 19, 19, 18.5; greatest length skull, 28.5, 29.2, 28.6; condylobasal length (as in Hollister, 1914:429, from condylion to alveolar point, not to most anterior point of premaxillae), 26.3, 26.3, 26.0; zygomatic breadth, 15.2, 15.4, 15.4; interorbital breadth, 4.9, 4.6, 4.8; breadth braincase, 12.2, 12.7, 12.4; length nasals, 10.9, 11.2, 10.7; maxillary toothrow, 4.4, 4.3, 4.5.

Remarks.—*Onychomys leucogaster* occurs with *O. torridus* at several places in the Huachucas, but it would appear that *O. leucogaster* is not found as far up the alluvial fans as *O. torridus*.

Grasshopper mice (both *O. leucogaster* and *O. torridus*) were frequently in association with the 3 species of *Dipodomys* and *Perognathus* (other than *intermedius*), but in Ramsey, Miller, and Carr canyons, grasshopper mice were present above the "*Dipodomys*" zone.

Small burrows, dug nearly straight down into the ground to a depth of 6 to 8 inches before angling off, were thought to be of *Onychomys*. We had no proof of this, but we did catch grasshopper mice where these holes were evident. There frequently would be a cluster of these holes, 6 or 8 in number, each 4 to 5 feet apart. We assumed one mouse may have made all of the holes in one such group.

In the Huachucas, where the 2 species of *Onychomys* occur together, it is difficult to distinguish readily between the species. It is easier to identify those animals in adult pelage; those in the gray-colored juvenal pelage are most difficult. Most useful characters for recognizing *O. leucogaster* were: short tail, less than half the length of body, rather than more than half the length of body; skull larger (greatest length more than 27.7 rather than less than 27.7 mm.); and M¹ less than half, rather than more than half, the length of the molar toothrow.

Onychomys torridus torridus (Coues)

SOUTHERN GRASSHOPPER MOUSE

Hesperomys (Onychomys) torridus Coues, Proc. Acad. Nat. Sci. Phila., 1874:183, 1874. Camp Grant, Graham Co., Arizona.

Onychomys leucogaster, var. *torridus*, Herrick, Geol. and Nat. Hist. Surv. Minn., 1884:183, 1885.

Onychomys torridus, Merriam, No. Amer. Fauna, 2:3, 1889.

Records of occurrence.—7 mi. ESE Fort, 6¹; 8 mi. SE Fort, 2; mouth of Ramsey Canyon, 1; mouth of Carr Canyon, 3²; mouth of Miller Canyon, 2³; mouth of Montezuma Canyon, 1.

Comparisons.—Specimens from the Huachucas agree most closely with specimens of *O. t. torridus* although the skulls in the Huachucan specimens average larger in some measurements than do other specimens of *O. t. torridus*.

Measurements.—Three males and 3 females, all in adult pelage and with worn teeth, measure, respectively: total length, 139¹, 144¹, 140², 145³, 148¹, 150¹; tail, 49, 55, 53, 54, 59, 58; hind foot, 23, 22, 22, 22, 23, 22; ear from notch, 18, 20, 18, 23, 18, 18; greatest length skull, 26.0, 26.4, 26.2, 26.5, 26.7, 26.6; condylobasal length (after Hollister, 1914:429), 23.9, 24.3, 23.7, 24.2, 24.4, 24.1; zygomatic breadth, 13.1, 13.2, 13.6, 12.8, 13.4, 13.3; interorbital breadth, 4.7, 4.5, 4.5, 4.4, 4.3, 4.5; breadth brain-case, 11.6, 11.6, 11.5, 11.1, 11.6, 11.6; length nasals, 9.8, 10.3, 10.3, 10.7, 9.9, 10.2; maxillary toothrow, 3.8, 3.5, 4.0, 3.8, 3.9, 4.1.

Remarks.—*Onychomys torridus* is found everywhere that *O. leucogaster* is and in some other places besides. *O. torridus* is more abundant on the most xeric portions of the alluvial fans and flats, as at 7 miles east-southeast of Fort Huachuca. However, *O. torridus* occurs farther up the alluvial fans than does *O. leucogaster* in both Miller and Carr canyons. Here they were present above the *Dipodomys*-zone, and in association with *Perognathus flavus*.

One grasshopper mouse was recovered from the stomach of a rattlesnake, *Crotalus atrox*, at 5000 feet, in Ramsey Canyon. Whether it was *O. torridus* or *O. leucogaster* was not ascertained.

Of 5 mature females taken in August, 3 had embryos (2, 4, and 5 embryos, respectively).

Reithrodontomys montanus montanus (Baird)

PLAINS HARVEST MOUSE

Reithrodon montanus Baird, Proc. Acad. Nat. Sci. Phila., 7:335, 1855. Upper end of San Luis Valley, Saguache Co., Colorado.

Reithrodontomys montanus, Allen, Bull. Amer. Mus. Nat. Hist., 5:80, 1893.

Records of occurrence.—Mouth of Miller Canyon, 1¹; Miller Canyon (Broken Arrow Ranch), 1²; mouth of Ramsey Canyon, 1³.

Comparisons.—The two males, which are not fully adult, are pale in coloration, being paler than specimens of *R. m. griseus* available to us from Kansas. One specimen (mouth of Miller Canyon) shows some approach toward *griseus* from Texas, judging from Howell's (1914:23) description, for it is brightly colored, yellowish, especially along the lateral line and cheeks, and has a large skull. However, this same specimen, in such features as large skull, large ears, and yellowish coloration may show approach to *Reithrodontomys burti* as described by Benson (1939:147). This specimen, in most features, is nearest to *montanus*, but probably any specimens from southern Arizona should be checked to see if they are intermediate between *montanus* and *burti*.

Measurements.—Two males (4514³, subadult; 4516², young adult) and 1 aged female (4515¹, teeth worn smooth): total length, 116, 122, 130; tail, 64, 55, 59; hind foot, 16, 15, 18; ear from notch, 15, 13, 16; greatest length of skull, 19.0, 18.9, —; basilar length, 13.9, 14.2, 15.5; greatest breadth of braincase, 9.7, 9.3, 9.8; interorbital breadth, 3.0, 2.7, 2.8; length of nasals, 7.2, 6.7, —; alveolar length of maxillary toothrow, 3.2, 3.5, 3.5.

Remarks.—At the mouth of Miller Canyon, *R. montanus* was found along an abandoned roadway grown up with *Senecio* and grama grass. It was in exactly this same area that *Baiomys taylori ater* was taken by Philip Blossom in March, 1941. We could catch no *Baiomys* nearly 10 years later, but did get 1 *R. montanus* and 2 *R. fulvescens* here. The specimen from the Broken Arrow Ranch was discovered during the day in a dazed condition on the floor of a room in which we were preparing mammals. We do not know how the animal happened to be there, for the cabin was infested, to our knowledge, with a good number of *Peromyscus boylii* only. The specimen from Ramsey Canyon occurred with the 2 other species of *Reithrodontomys*.

The one female had 4 embryos on August 14.

These specimens represent the first records of *Reithrodontomys montanus* from Arizona. Benson (1939:150) records this species from northeastern Sonora and north-central Durango. If specimens of harvest mice from throughout southeastern Arizona were examined for the diagnostic characters given by Hooper (1952), we believe still more specimens of *R. montanus* might be uncovered.

Reithrodontomys megalotis megalotis (Baird)

WESTERN HARVEST MOUSE

Reithrodon megalotis Baird, Mamm. N. Amer., p. 451, 1857. Between Janos, Chihuahua, and San Luis Springs, Grant Co., New Mexico.

Reithrodontomys megalotis, Allen, Bull. Amer. Mus. Nat. Hist., 5:79, 1893.

Records of occurrence.—Mouth of Ramsey Canyon, 4¹; Sylvania (Peterson's Ranch), 1²; NW slope Carr Peak, 8500 ft., 2³(1, skeleton only).

Comparisons.—These specimens seem referable to *R. m. megalotis* and not to *R. m. arizonensis* described from the Chiricahua Mountains (Rock Creek) only 70 miles away. The specimens are as pale as *R. m. megalotis* from Nevada and show none of the dark coloration ascribed to *arizonensis*.

Measurements.—One adult male (4517²) and 3 adult females (4521¹, 4518¹, 4522³): total length, 151, 151, 143, 146; tail, 81, 75, 74, 80; hind foot, 18, 18, 18, 17; ear from notch, 14, 14, 13, 15; greatest length of skull, 21.0, 21.8, 21.5, 21.2; basilar length, 15.4, 16.0, 16.3, 15.5; greatest breadth of braincase, 9.5, 10.3, 9.9, 10.0; interorbital breadth, 2.9, 3.1, 3.0, 3.1; length of nasals, 8.2, 8.4, 8.3, 8.2; alveolar length of maxillary toothrow, 3.2, 3.2, 3.3, 3.5.

Remarks.—On the alluvial fan in the mouth of Ramsey Canyon, 3 species of *Reithrodontomys* were obtained: *R. megalotis megalotis*, *R. fulvescens fulvescens*, and *R. montanus griseus*. All 3 were caught in the same trap line and no differences in ecological niches were noted. Harvest mice occurred here among the thicker, less grazed grasses along the barbed wire fence and along the shoulders of the road. Closely associated with the harvest mice were: *Dipodomys ordii*, *Dipodomys merriami*, *Dipodomys spectabilis*, *Sigmodon hispidus*, *Sigmodon minimus*, *Perognathus hispidus*, *Perognathus penicillatus*, and *Onychomys torridus*. Had we been able to distinguish more readily between the species of harvest mice as we caught them in the field, we might have detected slightly different ecological associations for the 3 species of *Reithrodontomys*.

On the west side of the Huachucas, the specimen from Sylvania was caught alive at dusk in the grass near a pond and from the area where, presumably, *Sigmodon ochrognathus* was obtained in 1940 by Seth Benson.

Near the summit of Carr Peak a *Reithrodontomys megalotis* was taken at 8400 feet, alongside a rock adjacent to a dense thicket of *Ribes*. This animal had been caught relatively late in the morning (probably about 8:00 A.M.) judging from its condition. In this general area there were pines, Douglas fir, aspen, and white fir, and such mammals as *Neotoma mexicana*, *Peromyscus maniculatus rufinus*, and *Peromyscus boylii*. We were confident that harvest mice were present, for on the previous day Goodpaster had found the nest of an adult harvest mouse inside the decaying stump of a pine, about 5 feet above the ground, and containing a skeleton.

Of the 3 females, one had 4 embryos on August 19.



FIG. 27. Fulvous harvest mouse, *Reithrodontomys fulvescens fulvescens*, at water tank, Broken Arrow Ranch, mouth of Miller Canyon. Photographed August, 1950, by W. W. Goodpaster.

***Reithrodontomys fulvescens fulvescens* Allen**

FULVOUS HARVEST MOUSE

Reithrodontomys mexicanus fulvescens Allen, Bull. Amer. Mus. Nat. Hist., 6:319, 1894. Oposura, Sonora, Mexico.

Reithrodontomys fulvescens, Allen, Bull. Amer. Mus. Nat. Hist., 7: 138, 1895.

Records of occurrence.—Mouth of Miller Canyon, 2¹; Miller Canyon (Broken Arrow Ranch), 1; mouth of Ramsey Canyon, 1.

Comparisons.—These specimens are all immature, and comparable material of *R. f. fulvescens* is not available to us. Since these localities in the Huachucas are only about 110 miles north of the type locality of *fulvescens*, the specimens are referred to that subspecies. Specimens of this species from Continental, Tumacacori Mission, and Phoenix, Arizona, also are regarded by Burt (1933:119) as *R. f. fulvescens*.

Measurements.—Two subadult females (4525¹, 4526¹): total length, 155, 153; tail, 88, 89; hind foot, 20, 19; ear from notch, 14, 14; greatest

length of skull, 20.2, 20.3; basilar length, 15.0, 15.1; greatest breadth of braincase, 10.3, 10.2; interorbital breadth, 3.1, 3.2; length of nasals, 7.1, 7.4; alveolar length of maxillary toothrow, 3.7, 3.7.

Remarks.—*R. fulvescens* occurred with *R. montanus* in the short grass on the alluvial fan in Miller Canyon. On the more arid alluvial fan in Ramsey Canyon, *R. fulvescens* was found with *R. megalotis* (ratio 1 *fulvescens* to 4 *megalotis*) and *R. montanus* (one specimen). This was in an area of scattered mesquites, grama grasses, and various other grasses. Elsewhere in southern Arizona, Burt (*loc. cit.*) found *fulvescens* and *megalotis* occurring together. While collecting bats at the water tank of the Broken Arrow Ranch at dusk, one *R. fulvescens* was caught alive in the short grass near the oaks (see Fig. 27).

***Baiomys taylori ater* Blossom and Burt**

PIGMY MOUSE

Baiomys taylori ater Blossom and Burt, Univ. Mich., Mus. Zool., Occ. Papers, 465:2, 1942. 7 mi. W Hereford, Cochise Co., Arizona.

Records of occurrence.—9 mi. W Hereford (near Nicksville), 10; 7 mi. W Hereford, 1; 5 mi. W Hereford, 5 (all specimens in Mus. Zool., Univ. Michigan).

Comparisons.—The above specimens are paratypes. Blossom and Burt (1942) described this race on its darker color above and pronounced cinnamon buff wash on the underparts.

Measurements (from Blossom and Burt, *op. cit.*).—Twelve males and 5 females give the following average, minimum, and maximum measurements: total length, 103(98–108), 108(102–115); tail, 41(37–45), 44 (41–46); hind foot, 13.4(12.5–14.0), 13.6(13.0–14.2); ear from notch, 10.8(9.5–11.6), 11.4(10.5–11.7); greatest length skull, 17.5(16.9–18.1), 17.5(17.3–17.9); condylobasal length, 16.3(15.7–17.0), 16.6(16.2–17.1); zygomatic breadth, 9.4(9.2–9.6), 9.5(9.2–9.8); interorbital constriction, 3.6(3.4–3.8), 3.5(3.5); nasals, 6.2(5.8–6.5), 6.3(6.1–6.5); bony palate, 2.7(2.5–3.0), 2.8(2.6–3.2); palatine slits, 3.7(3.5–3.9), 3.8(3.5–4.0); upper molar toothrow, 3.2(3.1–3.4), 3.2(3.1–3.3).

Remarks.—Pigmy mice, *Baiomys*, were caught by Philip Blossom in March, 1941, on the road from Nicksville to Hereford and along the now abandoned portion of the road that went due north from the mouth of Miller Canyon. The present Highway 92 goes northwest from Miller Canyon toward Nicksville (see map, p. 37). Along the road to Hereford, *Baiomys* were taken by Blossom only on the south side of the road; and from Nicksville to the entrance to the Y Lightning Ranch, in the ungrazed area between the road and the fence. Along the short, north-south dirt road, now abandoned, the mice were on the west side, the

greatest concentration of mice anywhere in the area. The pigmy mice were taken in a rather heavy cover of grass and weeds in which there was scattered the shrubby *Senecio longilobus*. The strips along the roads were not much more than 20 feet wide by 1300 feet long.

In August, 1950, we re-trapped the area where Philip Blossom had caught 15 *Baiomys*. *Sigmodon (hispidus only, not minimus)* was present, as well as *Perognathus*, *Onychomys*, and *Reithrodontomys*. No *Baiomys* were caught in approximately 600 trap nights. The roadway from Nicks-ville to Hereford has been widened, and the road scraper has removed all of the vegetation to within about 2 feet of the fence. Enough suitable habitat for pigmy mice may no longer be present along this road. However, it seemed to us that conditions along the abandoned north-south road should not have altered, and might be even more suitable for *Baiomys*. We concentrated most of our trapping for *Baiomys* here, but to no avail. If pigmy mice are still present in this general area, they were at a low point in August, 1950.

Peromyscus maniculatus sonoriensis (LeConte)

DEER MOUSE

Hesp[eromys]. sonoriensis LeConte, Proc. Acad. Nat. Sci. Phila., 1853:413, 1853. Santa Cruz, Sonora, Mexico.

[*Peromyscus texanus*] *sonoriensis*, Mearns, Proc. U.S. Nat. Mus., 18: 446, 1896.

Peromyscus maniculatus sonoriensis, Osgood, No. Amer. Fauna, 28: 89, 1909.

Records of occurrence.—Mouth of Ramsey Canyon, 1¹; mouth of Brown Canyon, 1²; flat, 7 mi. ESE Fort, 1³; mouth of Miller Canyon, 2(1 in Mus. Zool., Univ. Mich.). Additional records: Fort Huachuca, 3(U.S. Nat. Mus., see Osgood, 1909:92), Tanner's Canyon, above the Post Garden, 7 (see Mearns, 1907:388).

Comparisons.—The specimen in adult pelage from Brown Canyon is typical *P. m. sonoriensis*, for it is pale in color and fairly long tailed. The color of the back is Ochraceous-Buff slightly tipped with black, with the back no darker than the sides. The posterior half of the pinna of the ear is pale colored, inside and outside. The specimen from Ramsey Canyon has a peculiar color; there is a slight purplish cast to the dorsum. The coloration of the ears is not known, for they were eaten away by ants while the specimen was in the trap. The Huachucas are within 15 to 20 miles of the type locality of *P. m. sonoriensis*.

Measurements.—Two subadult males^{1, 2}: total length, 153, 151; tail, 70, 73; hind foot, 19, 22; ear from notch, —, 17; greatest length skull, 25.4, 25.4; basilar length, 19.2, 19.3; breadth braincase, 11.5, 11.0; interorbital constriction, 4.0, 4.0; length nasals, 9.9, 9.9; shelf bony palate, 4.2,

3.7; palatine slits, 5.2, 5.3; diastema, 6.6, 6.3; postpalatal length, 8.9, 8.9; alveolar length maxillary toothrow, 3.8, 3.9.

Remarks.—Deer mice were exceedingly scarce throughout the Mountains. We could have obtained hundreds of *Peromyscus boylii* or *Perognathus penicillatus* for each *Peromyscus maniculatus* taken.

The specimen from 7 miles east-southeast of the Fort was taken at the entrance of a burrow of a kangaroo rat. In Brown Canyon, the only 1 taken was in the overgrown garden patch of an abandoned house. In Miller and Ramsey canyons, the deer mice were taken far down on the alluvial fans, and along the dry gullies of the creeks. Dice and Blossom (1937:35) obtained specimens in *Senecio* and grasses, 1 in an open stand of oaks on the alluvial fan (Miller Canyon), and 1 near a stream with a few sycamores, walnuts, and oaks.

The skull of 1 specimen³ is badly deformed, with the rostrum pulled about 33° to the right of the midline. The right upper incisor does not occlude and has grown in such a fashion as to form two-thirds of a loop. The unworn upper incisor still retains the bifid tip, characteristic of the teeth in many newly born mammals. This specimen is immature, probably only a few months old.

***Peromyscus maniculatus rufinus* (Merriam)**

DEER MOUSE

Hesperomys leucopus rufinus Merriam, No. Amer. Fauna, 3:65, 1890.

San Francisco Mountain, 9000 ft., Coconino Co., Arizona.

Peromyscus rufinus, Allen, Bull. Amer. Mus. Nat. Hist., 8:252, 1896.

Peromyscus maniculatus rufinus, Osgood, No. Amer. Fauna, 28:72, 1909.

Records of occurrence.—NW slope Carr Peak, 8400 ft., 1.

Comparisons.—The specimen from Carr Peak is markedly darker and more reddish than specimens of *Peromyscus maniculatus* from the alluvial fans. Most striking is the difference in color on the nose and between the eyes; in the Carr Peak specimen it is near Vinaceous-Cinnamon; in *sonoriensis*, near Light Ochraceous-Buff. The posterior half of the pinna is blackish, both inside and outside. This specimen is as dark and reddish as specimens of *Peromyscus maniculatus rufinus* from 9000 feet in the Graham Mountains, Arizona.

The reference of this specimen from the Huachucas to *P. m. rufinus* places this subspecies within 18 miles of the type locality of *P. m. sonoriensis*. We are aware of the fact that Osgood (1909:89) points out that *P. m. sonoriensis* displays slight color dimorphism, with a pale phase and a dark phase. However, we prefer to regard the darker animal in the Huachucas as *rufinus*, and not a dark phase of *sonoriensis*. The specimen regarded as *P. m. rufinus* occurs only at the higher elevations; no

dark-colored animals were found on the lower alluvial fans. The situation in the Huachucas is no different than on some other mountain ranges in Arizona and New Mexico—the yellow pine-fir belt is inhabited by *rufinus*; the lower slope by *sonoriensis*.

Measurements.—One female, adult: total length, 163; tail, 66; hind foot, 19.5; ear from notch, 17.5; greatest length skull, 25.2; basilar length, 19.1; breadth braincase, 11.5; interorbital constriction, 3.7; length nasals, 10.4; shelf bony palate, 3.8; palatine slits, 5.2; diastema, 6.6; postpalatal length, 9.0; alveolar length maxillary toothrow, 3.8.

Remarks.—On Carr Peak, the deer mouse was taken among pines, Douglas fir, and *Ribes*. Thickets of aspens were nearby. Within 10 feet from where the deer mouse was taken, and along the same pine log a *Peromyscus boylii* was captured. A short distance away a *Reithrodontomys megalotis* was taken.

***Peromyscus leucopus arizonae* (Allen)**

WHITE-FOOTED MOUSE

Sitomys americanus arizonae Allen, Bull. Amer. Mus. Nat. Hist., 6: 321, 1894. Fairbank, Cochise Co., Arizona.

Peromyscus texanus arizonae, Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30:84, 1901.

Peromyscus leucopus arizonae, Osgood, No. Amer. Fauna, 28:126, 1909.

Records of occurrence.—Miller Canyon, about half-way up, approximately 6100 ft., 1.

Comparisons.—This specimen is darker than our *Peromyscus maniculatus*, but differs in color from *P. m. rufinus* from higher up the mountain in being less reddish and thus causing the dark to be more conspicuous. The tail is not narrowly dark striped above and is not sharply bicolor. There is an indistinct dark dorsal stripe along the middorsal line. The ears are dark, much as in *P. m. rufinus*.

In dark color our specimen corresponds well with *P. leucopus arizonae* described from Fairbank, 23 miles away.

Measurements.—Young adult male: total length, 164; tail, 78; hind foot, 23; ear from notch, 17; greatest length skull, 27.8; basilar length, 20.3; breadth braincase, 12.8; interorbital constriction, 4.3; length nasals, 10.2; shelf bony palate, 4.5; palatine slits, 5.0; diastema, 6.9; postpalatal length, 9.9; alveolar length maxillary toothrow, 3.9.

Remarks.—The 1 specimen of *Peromyscus leucopus* was taken in a thicket of horsetail (*Equisetum*) near a spring in a woodland of oak, walnut, maple, sycamore, and some Douglas fir. This is in the damp, cool part of Miller Canyon, at about 6100 feet, near the spot where water

is pumped from Miller Creek. Most closely associated with this spot, in our minds, was *Sorex vagrans*, for 4 specimens were also taken here.

It was a surprise to us that *Peromyscus leucopus* should occur so high in the Mountains. This species had previously been taken out on the desert flats, along the stream (San Pedro River) near Hereford. We regarded our specimen as an aberrant *P. maniculatus* until we had examined the skull more closely.

***Peromyscus boylii rowleyi* (Allen)**

BRUSH MOUSE

Sitomys rowleyi Allen, Bull. Amer. Mus. Nat. Hist., 5:76, 1893. Noland Ranch, San Juan River, San Juan Co., Utah.

P[eromyscus]. b[oylii]. rowleyi, Mearns, Proc. U.S. Nat. Mus., 19: 139, 1896.

Peromyscus boylii rowleyi, Osgood, N. Amer. Fauna, 28:145, 1909.

Records of occurrence.—8 mi. W Fort, 4; Garden Canyon, 1; mouth of Brown Canyon, 1; Carr Canyon Reef, 7200 ft., 4¹; NW slope Carr Peak, 8400 ft., 2; Nicksville, 1²; mouth of Miller Canyon, 69³; half-way up Miller Canyon, 4; Ash Canyon, 2.

Comparisons.—Specimens from the Huachucas are paler and slightly smaller than *P. b. attwateri*. Numerous named forms, synonymized by Osgood (1909) under *P. b. rowleyi*, were described from within a short distance of the Huachucas: *metallicola*, Providencia Mines, Sonora; *pinalis*, Granite Gap, Grant Co., New Mexico; and *penicillatus*, Franklin Mountains, near El Paso, Texas. Should one of these forms prove to be recognizable, material from the Huachucas would have to be compared with it to determine if the name was applicable to the Huachucan material.

Measurements.—Ten males³ and 10 females^{1, 2, 3}, with teeth either slightly or much worn, give the following average, minimum, and maximum measurements: total length, 185.7(174–197), 195.0(181–215); tail, 96.5(83–100.4), 100.3(86–110); hind foot, 21.3(20–22), 22.2(21–23); ear from notch, 19.1(17–20), 19.4(18–22); greatest length skull, 27.2(26.7–27.9), 27.8(27.0–28.8); basilar length, 20.3(20.0–20.6), 20.9(20.2–22.2); greatest breadth braincase, 12.3(12.0–12.6), 12.6(12.3–13.0); interorbital constriction, 4.2(4.0–4.5), 4.3(4.1–4.7); nasals, 10.4(10.0–11.6), 10.6(10.0–11.7); palatine slits, 5.3(4.9–5.5), 5.3(5.1–5.7); shelf bony palate, 4.0(3.7–4.4), 4.4(4.3–4.7); diastema, 6.8(6.6–6.8), 7.0(6.6–7.1); postpalatal length, 9.6(9.4–9.8), 9.8(9.2–10.3); alveolar length maxillary toothrow, 4.1(3.9–4.2), 4.2(4.0–4.3).

Remarks.—Brush mice, *Peromyscus boylii*, occurred from the lower edge of the oak belt, through the canyons with walnut and sycamore,

and up the pine- and fir-covered slopes to the very top of the Mountains. They were, by far, the commonest mammals in the brushy and tree covered portions of the Mountains, being as numerous there as *Dipodomys* or *Perognathus* were on the alluvial fans. Within the wooded portions of the slopes, *P. boylii* seemed about equally abundant in all of the different plant belts with the exception of the oak belt where it was probably most abundant.

Brush mice seem as much, or more, at home off the ground than on it. They forage in oaks, climb the walls of buildings and nest in attics, and have homes on the rough walls of mine tunnels. One mouse was watched in an oak. It apparently was gathering food to be stored in the attic of a cabin just below. In seeking food and in navigating the branches, it behaved much like a squirrel.

At the Broken Arrow Ranch, brush mice were so numerous around all the buildings, both occupied and empty, as to be pests. They became active in the attics about dark, and activity did not cease entirely until an hour or 2 after sun up. The mice negotiated, with amazing skill and without hesitation, the straight and seemingly smooth inside walls of the cabins. The great abundance of brush mice in and around buildings may be a most important factor in preventing house mice, *Mus musculus*, from becoming well established in the Huachucas. We found house mice at only one place.

Brush mice lived in some of the deeper mine shafts. In these shafts they built open nests, much like the nests of the goldfinch. In a mine between Ash and Montezuma canyons several nests were found at the very back end of the shaft, more than 100 yards from the entrance. There was little if anything for these mice to feed on at this end of the mine, and they would have to go a minimum of 300 feet to the mouth of the mine. If these mice went foraging for food twice during the night, and in a straight route, they would travel nearly one-fourth mile. Furthermore, this travel was along the barren, smooth shaft where the mice would seemingly have been easy victims of predators.

In chasing a *Peromyscus boylii* along a mine shaft, we found that it purposely avoided the small trickle of water on the floor. The mouse would run up the rocky walls of the shaft before it would enter the water.

Peromyscus boylii must always have been numerous in the Mountains. Osgood had 133 specimens from the Huachuca Mountains by 1909. However, in August, 1949, we had difficulty catching these mice in places other than around buildings. We suspect that with the good acorn crop that year, the mice were not readily attracted to our traps. Baiting the traps with pecan meats rather than rolled oats proved somewhat more effective.

In the Huachucas young mice, probably less than 2½-months old, were bearing young in late August. For example, a specimen with the lead-colored juvenal pelage, except for a small amount of ochraceous along the lateral line, contained 3 embryos on August 14. Furthermore, it seems evident that young are produced in every month of the summer, judging from the size and stages of molt in our catch. Of 6 females pregnant in August, 1 had 3 embryos, 4 had 4, and 1 had 5.

***Peromyscus pectoralis eremicoides* Osgood**

WHITE-ANKLED MOUSE

Peromyscus attwateri eremicoides Osgood, Proc. Biol. Soc. Wash., 17: 60, 1904. Mapimi, Durango, Mexico.

Peromyscus pectoralis eremicoides, Osgood, No. Amer. Fauna, 28: 163, 1909.

Records of occurrence.—“Fort Huachuca,” 3 (U.S. Biol. Surv. coll.).

Comparisons.—The three specimens identified by Osgood (1909:163) as *Peromyscus pectoralis* from the Huachucas are removed by 280 miles or more from the nearest part of the main range of *P. pectoralis* (as in Chihuahua or Texas). These 3 specimens were carefully examined, especially to determine if they had been identified correctly as to species. All 3 are immatures. They obviously are not *Peromyscus maniculatus*, *P. leucopus*, *P. eremicus*, or *P. merriami*, although the skins superficially look much like any of the last 3 species. They are nearest to *P. pectoralis*, as known to us by specimens from Durango and Chihuahua, and *P. boylii* from the Huachucas. They differ from *P. boylii* of comparable age as follows: total length less (168–181 mm. vs. 183–198); tail shorter (87–96 vs. 92–113); ear, measured in the dry skin, shorter (15.6–16.4 vs. 16.1–18.2); all skull measurements averaging smaller, especially, for example, greatest length (25.0–25.5 vs. 26.5–27.6); and length of nasals (9.1–9.4 vs. 9.8–10.8). Comparison of the sample of *P. boylii* and the 3 supposed *P. pectoralis* shows there is overlap in only 3 of the 11 cranial measurements: least interorbital breadth, shelf of bony palate, and alveolar length of maxillary toothrow. In the length of toothrow, the average for *pectoralis* was 4.0; for *boylii*, 4.2. The auditory bullae appear to be slightly smaller in the 3 *pectoralis*. As regards color, the 3 specimens show considerable variation, and the color of each can be matched in the large series of *boylii*.

The 3 specimens of *pectoralis* from the Huachucas differ from specimens of *pectoralis* in Mexico—from Saltillo, Inde, and Mapimi—in slightly shorter skulls, slightly shorter ears, slightly smaller auditory bullae, and dark rather than white tarsi. The difference noted in the size of the skull may not be accurate, and the reverse may actually be true, for the specimens from Mexico are adults whereas those from the Huachu-

cas are quite young. Material is not available for a comparison with *P. p. laceianus*, but judging from Osgood's account (1909:164), the Huachucan specimens have shorter feet and smaller skulls.

The 3 specimens might best be referred to *P. pectoralis* and to the subspecies *eremicoides* as Osgood did, but as he says, further material is much needed. No specimens collected by us appear to be *P. pectoralis*, although we have carefully scrutinized our specimens of *P. boylii*, for it appears to be difficult to differentiate between these 2 species. We are not fully convinced that these 3 specimens called *pectoralis* by Osgood could not be 3 widely divergent or aberrant *boylii*, for the latter species shows much individual variation. However, we are not in a position now to prove that these are not *pectoralis*, but suspect that *boylii* and *pectoralis* might be found to be conspecific.

Measurements.—Three specimens, 1 female and 2 males, all juveniles or immatures but in adult or subadult pelage, measure, respectively: total length, 168, 181, 181; tail, 87, 96, 93; hind foot, 20, 20, 20; ear, from notch, dry, 15.6 16.4, —; greatest length skull, 25.2, 25.0, 25.5; basilar length, 18.2, 18.3, 18.2; greatest breadth braincase, 11.7, 12.1, 12.4; least interorbital constriction, 3.9, 4.1, 4.4; length of nasals, 9.4, 9.1, 9.4; shelf bony palate, 3.8, 3.9, 3.8; palatine slits, 5.0, 5.2, 5.2; diastema, 5.8, 6.1, 6.0; postpalatal length, 8.7, 8.4, 8.6; alveolar length maxillary toothrow, 3.9, 3.9, 4.1.

Remarks.—The 3 specimens of white-ankled mice were collected in the late spring of 1892 by A. K. Fisher and J. A. Loring. They are labeled as "Fort Huachuca" and we have no other information about their occurrence.

As pointed out above, these specimens, if we are correct in calling them *Peromyscus pectoralis*, are some 280 miles from the nearest populations of this species. Our collecting at various times between 1949 and 1952 has produced many *Peromyscus* but none seems to be *P. pectoralis*.

Peromyscus eremicus eremicus (Baird)

CACTUS MOUSE

Hesperomys eremicus Baird, Mamm. No. Amer., 1857:479, 1857. Old

Fort Yuma (opposite Yuma, Arizona), Imperial Co., California.

Peromyscus eremicus, Allen, Bull. Amer. Mus. Nat. Hist., 7:226, 1895.

Records of occurrence.—Mouth of Carr Canyon, 2; mouth of Miller Canyon, 6; 4½ mi. SE Fort Huachuca, 3. Additional record: "Fort Huachuca," 8 (U.S. Nat. Mus., see Osgood, 1909:242).

Comparisons.—Osgood (1909) records *eremicus* from the Huachucas as *P. e. eremicus* "approaching *anthonyi*," but on his distribution map

indicates that specimens from there would be *anthonyi*. Our specimens, on the basis of size and coloration, seem nearest to *P. e. eremicus*, but we realize that the specimens are not fully adult.

Measurements.—Average of 4 subadult males and 2 subadult females are, respectively: total length, 186.5, 187, 187; tail, 95.8, 98, 100; hind foot, 20.5, 21, 20; ear from notch, 17.3, 19, 17. The average for 4 subadult males is: greatest length skull, 25.5; basilar length, 19.1; greatest breadth braincase, 11.8; interorbital constriction, 4.2; length nasals, 9.4; palatine slits, 4.9; shelf bony palate, 3.5; diastema, 6.5; postpalatal length, 9.0; alveolar length maxillary toothrow, 3.8.

Remarks.—The specimens in Carr Canyon were taken along the edge and part way up the alluvial fan. Dry, rocky hills, covered with *Agave*, arose sharply from the fan adjacent to where these cactus mice lived. Beneath a large rock there was the house of a pack rat, *Neotoma albicula*. A trap set near this house produced a cactus mouse in August, 1950, and a trap set at the very same spot caught another in December, 1952. In the winter of 1952, 5 cactus mice were taken in the mouth of Miller Canyon at a spot we had frequently trapped during the summertime but where we had caught only 1 cactus mouse previously. Both here and in Carr Canyon, the mice occurred above the *Dipodomys*-zone but below the tree zone. At 4½ mi. SE Fort, the mice were present among mesquite, white thorn, and yucca, and in association with *Neotoma albicula* and *Dipodomys merriami*.

Sigmodon hispidus cienegeae A. B. Howell

HISPID COTTON RAT

Sigmodon hispidus cienegeae A. B. Howell, Proc. Biol. Soc. Wash., 32: 161, 1919. Bullock's Ranch, 4 mi. E Fort Lowell, Pima Co., Arizona.

Records of occurrence.—Mouth of Miller Canyon, 16¹; mouth of Ramsey Canyon, 2; along road between mouths of Ramsey and Carr canyons, 2; 9 mi. W Hereford, 7 (Mus. Zool., Univ. Mich.); mouth of Montezuma Canyon, 1.

Comparisons.—Judging from the large size of specimens from the Huachucas, particularly the large hind foot, long nasals, and large molar teeth, they are most nearly referable to *S. h. cienegeae*, and not, for example, to *S. h. confinis* (Safford, Graham Co., Arizona). It seems advisable to us, however, that there be a re-evaluation of all the kinds of *Sigmodon hispidus* in the Southwest, for the reliability of such characters as size will need to be checked if it is shown that cotton rats continue to grow throughout their lifetime.

Adult specimens appear dark on the dorsum. Only 1 specimen is

slightly lighter than the rest. There is only a small amount of ochraceous showing along the lateral line on any of the specimens. The underparts appear grayish, with the basal portion of the hair being dark gray and the distal portion being whitish.

Measurements.—Three males¹ and 3 females¹, all with teeth showing some to excessive wear, are, respectively: total length, —, 322, 300, 330, 315, —; tail, —, 131, 121, 143, 142, —; hind foot, 35, 36, 36, 35, 37, 35; ear from notch, 21, 24, 19, 20, 23, 21; greatest length skull, 40.4, 42.6, 38.3, 39.3, 37.2, 39.6; basilar length, 32.7, 34.3, 29.6, 32.6, 30.0, 32.0; zygomatic breadth, 22.4, 23.2, 21.0, 22.3, —, 21.9; greatest breadth braincase, 16.5, 16.8, 16.0, 16.2, 15.5, 15.7; interorbital constriction, 5.8, 6.1, 6.0, 5.5, 5.6, 5.6; length nasals, 15.0, 16.7, 14.5, 16.3, 14.8, 16.0; maxillary toothrow, 6.8, 6.4, 6.6, 7.0, 6.7, 7.4.

Remarks.—*Sigmodon hispidus* lived where there was a thick stand of grasses and weeds. An accumulation of dry tumble weeds among the grass seemed to increase the suitability of the site for cotton rats. Their runways were usually evident in the weeds. Cuttings of grass were frequently present in runs, but the absence of cuttings did not necessarily prove that it was not an active run. Cotton rats used the runs as much during the daytime as at night. We have the impression that *Sigmodon* was much more abundant in August, 1950, than in August, 1949. Although cotton rats were common in 1950, adults were wary and difficult to trap.

A dog dug out a nest of 4 immature cotton rats in August, 1950, at the Broken Arrow Ranch, Miller Canyon. The specimens did not have their eyes open, were about 95 mm. in total length, and were judged to be about 1 week old. Two specimens taken in March, 1941, were only a few weeks old, and must have been born in middle or late February. Judging from the sizes of the immature and subadult specimens we obtained in August, we believe that young cotton rats are produced from mid-February through August, and probably throughout the year. Of 5 mature females, 3 had 6, 10, and 12 embryos, respectively, in August.

Sigmodon minimus minimus Mearns

LEAST COTTON RAT

Sigmodon minima Mearns, Proc. U.S. Nat. Mus., 17:130, 1894.

Grassy hollows and flats between southern spurs Apache Mts., 1500 meters, 11 mi. SSW Hachita, *in* Hidalgo Co., New Mexico.

Records of occurrence.—Mouth of Ramsey Canyon, 3; mouth of Miller Canyon, 2¹; 7 mi. W Hereford, 2 (Mus. Zool., Univ. Mich.); Fort Huachuca (apparently the specimens Mearns, 1907:447, refers to as "Igo's Ranch at northern base Huachuca Mts."), 2 (U.S. Nat. Mus.).

Comparisons.—The 2 specimens from Igo's Ranch differ in some respects from topotypes of *S. m. minimus*: upper parts more reddish or ferruginous and underparts slightly more plumbeous. Mearns (1907: 448) pointed out these features. The adult from Miller Canyon is less reddish and appears very similar to specimens from the Animas Valley of New Mexico and the Santa Cruz River, Sonora. The variation in the Huachucan material probably is individual, and the specimens are regarded as *S. m. minimus*.

Measurements.—An adult female¹, with teeth well worn, has the following measurements: total length, 254; tail, 98; hind foot, 26; ear from notch, 18; greatest length skull, 33.8; basilar length, 28.4; greatest breadth braincase, 15.2; interorbital constriction, 4.9; length nasals, 12.4; palatine slits, 7.8; diastema, 9.4; maxillary toothrow, 6.1.

Remarks.—In the Huachucas wherever *Sigmodon minimus* occurs, so does *Sigmodon hispidus*. We could find no ecological difference between the 2 species.

Four of the specimens taken in August are only a few weeks old. The adult female, taken on August 18, contained 3 embryos.

In Miller Canyon, least cotton rats were present in a small cocklebur patch, but museum special traps were ineffective in catching them. It was decided to bury small steel traps in the runways, and the one adult female was taken in such a trap. Apparently, the live animal was swallowed up to the jaws of the trap by a snake. Upon our approach to the trap, the animal was regurgitated, for the snake was gone but the rat was dead, wet, and slimy.

The specimens at Igo's Ranch were taken in 1892 in an alfalfa field, according to A. K. Fisher.

***Sigmodon ochrognathus montanus* Benson**

YELLOW-NOSED COTTON RAT

Sigmodon ochrognathus montanus Benson, Proc. Biol. Soc. Wash., 53:157, 1940. Peterson's Ranch, Sylvania, 6100 feet, 2 mi. N Sunnyside, Cochise Co., Arizona.

Records of occurrence.—Peterson's Ranch (Sylvania), 6100 ft., 6(1 in U.S. Biol. Surv. Coll.; 5, not examined, in Mus. Vert. Zool., Univ. Calif.); head of Miller Canyon, 8400 ft., 1(Mus. Vert. Zool., Univ. Calif., not examined); mouth of Miller Canyon, 1(Mus. Zool., Univ. Mich.).

Comparisons.—Benson has pointed out (1940:157-158) that *S. o. montanus* differs from *S. o. ochrognathus* in having a sharply bicolored tail, yellowish hairs on inside of pinnae and on feet, less inflated auditory bullae, and larger ears.

Measurements.—Three young adult males, the first 2 from Sylvania,

the third from mouth of Miller Canyon, and 1 adult female from Sylvania: total length, 233, 236, 258, 234; tail, 100, 106, 115, 99; hind foot, 28, 28, 29, 28.5; ear from notch, 18, 18, 17.7, —; basal length, 27.8, 27.0, —, 28.4; greatest length of skull, —, —, 31.3, 32.7; zygomatic breadth, 18.7, 17.7, 18.2, 19.4; length of nasals, 11.3, 11.4, 11.0, 12.3; alveolar length of maxillary toothrow, 5.8, 5.9, 6.5, 6.1. Measurements of the males from Sylvania are from Benson (1940:158).

Remarks.—In the marshy area around the spring at Peterson's Ranch or Sylvania, on the west side of the Huachucas, *S. o. montanus* was taken in 1933 and 1940. In 1950 when we revisited Sylvania, most of the marsh area had been eliminated because ponds had been scooped out adjacent to the springs. No suitable habitat for cotton rats was encountered, and we saw no sign of any rats. If the ponds remain untended for some years, they should silt up and a marsh area should be re-established.

In 1950 our extensive trapping in Miller Canyon produced *Sigmodon hispidus* and *Sigmodon minimus* but no *S. ochrognathus*, although the latter species had been taken there previously.

Neotoma albigena albigena Hartley

WHITE-THROATED WOOD RAT

Neotoma albigena Hartley, Proc. Calif. Acad. Sci., 4(ser. 2): 157, 1894. Vicinity of Fort Lowell, Pima Co., Arizona.

Records of occurrence.—Mouth of Miller Canyon, 8; Carr Canyon, 1; 7 mi. ESE Fort, 1; mouth of Ramsey Canyon, 1; Sylvania, 2; 12 mi. SSE Fort, 1; 8 mi. W Fort, 1; Nicksville, 1. Additional records: Fort Huachuca, 19 (U.S. Nat. Mus., see Goldman, 1910:33).

Comparisons.—Our specimens agree closely with Goldman's (1910: 33) characterization of this form. Fully adult animals are a dull pinkish buff above. Immature or young adult rats are a dark gray, and above appear quite similar to *Neotoma mexicana*.

Measurements.—Average, minimum, and maximum measurements of 4 adult males and 2 adult females follow. In these specimens, the anterior, internal re-entrant angle of upper M^1 has been obliterated by wear, or nearly so. Total length, ♂, 329.7(300–346), ♀, 316, 305; tail, 146.3(138–159), 145, 150; hind foot, 34.8(34–36), 34, 34; ear from notch, 27.8(26–30), 27, 27; occipitonasal length, 44.5(43.1–46.5), 43.0, 42.9; basilar length, 36.2(34.6–37.5), 34.3, 34.3; zygomatic breadth, 22.7(22.2–23.5), 21.4, 22.3; interorbital breadth, 6.1(5.9–6.2), 5.6, 6.0; length of nasals, 16.6(15.3–17.9), 14.6, 14.8; length incisive foramina, 8.9(8.6–9.3), 8.7, 8.2; length palatal bridge, 7.6(7.0–8.4), 7.1, 7.4; alveolar length maxillary toothrow, 8.1(7.7–8.6), 8.6, 8.4.

Remarks.—White-throated wood rats are not common in the Moun-

tains proper. In the wooded area they occur in the oak-walnut-sycamore belt, and only around buildings in this belt. For example, 1 was caught alive in the drawer of an unused cabinet in an abandoned house at Sunnyside; an occupied nest was in a tool shed at Peterson Ranch, Sylvania; and another was beneath the floor of a barn at the Broken Arrow Ranch, Miller Canyon. Along the edge of the alluvial fan in Carr Canyon, 1 was caught at a nest beneath a solitary walnut tree alongside a large boulder, and 1 was taken at the mouth of a kangaroo rat burrow 7 miles east-southeast of the Fort.

No wood rats were found far back in mine tunnels, but 1 nest was noted just inside the cave at Canelo Gate. Included in this nest were such items as a match box, part of an inner tube, pieces of cholla cactus, seed pods of yucca, a piece of canvas, a few acorns, and sticks of various sizes. This animal had probably gone 100 yards or more for some of these items. No wood rat house was found at the base of *Agave* or prickly pear, a common nesting site for these animals.

Four of our specimens were parasitized with the larva of a cuterebra. One female had 2 embryos on August 4.

Neotoma mexicana mexicana Baird

MEXICAN WOOD RAT

Neotoma mexicana Baird, Proc. Acad. Nat. Sci. Phila., 7:333, 1855.

Mountains near Chihuahua, Chihuahua, Mexico.

Records of occurrence.—Carr Canyon Reef, 7200 ft., 1¹; northwest slope Carr Peak, 8500 ft., 1 (skeleton only); "Huachuca Mts." 3² (Chicago Nat. Hist. Mus.).

Comparisons.—Specimens from the Huachucas might be referable to *N. mexicana bullata* (Santa Catalina Mountains) or *N. m. mexicana* (Chihuahua and the Chiricahua and Rincon mountains, in Arizona). Goldman (1910) apparently had no specimens of this species from the Huachucas. Our specimens seem near to *N. m. mexicana*. Furthermore, we find no diagnostic features to justify recognizing *bullata* as a distinct subspecies. It is best regarded as a synonym of *N. m. mexicana*. The specimen from the Reef is darker than those labeled as "Huachuca Mts."

Measurements.—Two adult males² and 1 female¹, nearly adult: total length, —, 345, 263; tail, 160, 153, 109; hind foot, 32, 32, 33; ear from notch, 20, 24.5, 22; occipitonasal length, 44.0, 45.7, 38.6; basilar length, 35.6, 37.3, 31.0; zygomatic breadth, 23.1, 22.8, 20.7; interorbital breadth, 5.1, 5.0, 5.5; length nasals, 15.2, 17.4, 14.7; length incisive foramina, 9.6, 9.7, 8.5; length palatal bridge, 8.0, 7.7, 7.4; maxillary toothrow, 7.9, 8.0, 8.3.

Remarks.—The Mexican wood rat occurs high in the Mountains in the firs, pines, and aspens. One specimen was taken in such a habitat at about 8500 feet on Carr Peak. There was indication that several wood rats were

present here, although only one was taken. Another specimen was taken just outside the entrance to a mine on the top of Carr Canyon Reef. Mearns says (1907:492) "on the Mexican Line we found it only on the highest portions of the San Luis and Huachuca mountains." Price (in Allen, 1895:233) most surely is not distinguishing between *Neotoma mexicana* and *N. albicula* when he says, "Woodrats were abundant over the entire country visited, from the summits of the Huachuca, Graham and Chiricahua Mountains to the lowest desert regions."

Rattus rattus rattus (Linnaeus)

BLACK RAT

[*Mus*] *rattus* Linnaeus, Syst. Nat., 10th ed., 1:61, 1758. Upsala, Sweden.

Records of occurrence.—Fort Huachuca, 2 (U.S. Nat. Mus.).

Remarks.—In 1892, Mr. A. K. Fisher (1892) wrote of *Mus tectorum* (= *Rattus rattus*): "This rat was common about the hospital and granary, at both of which places it did considerable damage." Dr. T. E. Wilcox collected 2 of these rats at this time, an adult female and a juvenile, and sent them to the U.S. National Museum, where they are preserved in alcohol, 20780 and 20781. These have been examined and prove to be *Rattus rattus rattus*. At the present time no members of this genus are known to occur around the many buildings of the Fort or elsewhere in the Mountains, although we made repeated inquiry as to their presence.

Mus musculus musculus Linnaeus

HOUSE MOUSE

Mus musculus Linnaeus, Syst. Nat., 10th ed., 1:62, 1758. Upsala, Sweden.

Records of occurrence.—Carr Canyon Reef, 7200 ft., 3.

Comparisons.—The 3 specimens are dark in color, and 2 of the 3 have the underparts heavily washed with buffy.

Measurements.—Two adult females measure: total length, 182, 165; tail, 89, 85; hind foot, 19, 19; ear from notch, 15, 15; greatest length of skull, 23.0, 22.1; basilar length, 19.0, 18.1; greatest breadth of braincase, 10.0, 9.1; least interorbital constriction, 3.9, 3.5; length of nasals, 8.3, 7.9; shelf of bony palate, 3.7, 3.5; palatine slits, 5.7, 5.6; diastema, 6.5, 6.2; postpalatal length, 8.3, 7.8; alveolar length of maxillary toothrow, 3.6, 3.6.

Remarks.—The specimens from the Reef were taken at the garbage dump at Louis Seeman's. All of our trapping around other buildings and dumps produced no house mice. There reportedly were house mice in the buildings at the Fort. Buildings elsewhere, when infested with mice, were occupied by *Peromyscus boylii*. In 1894 W. W. Price reported (in

Allen, 1895:236) that he had caught "a single specimen . . . at a house in the Huachuca Mountains. Three years before a wagon load of seed grain had been brought there, and of two house mice nesting in the grain one had escaped. The one I caught was in all probability the one that escaped." Price may have been correct, for it is notable that the house mouse has not become well established at any place in the Mountains except the built-up, more heavily populated Fort.

However, in 1892, A. K. Fisher wrote, "The house mouse was common about the Post, and two males were captured at the hospital."

Erethizon dorsatum couesi Mearns

PORCUPINE

Erethizon epixanthus couesi Mearns, Proc. U.S. Nat. Mus., 19:723,
1897. Fort Whipple, Yavapai Co., Arizona.

Erethizon dorsatum couesi, Hall, Mamm. Nevada, p. 649, 1946.

Records of occurrence.—See *Remarks*.

Remarks.—Porcupines occur in the vicinity of the Huachuca Mountains, but it was difficult to determine how often they occur in the Mountains proper. Conflicting reports, by reliable observers, came to us. From these observations the following seems true: porcupines are most abundant, or more readily seen, along the San Pedro River, where they occur among and feed on the cottonwoods. Porcupines occur rarely, or are rarely seen, in the Mountains. It may be that there is a seasonal shift or migration of some porcupines from the river up into the Mountains.

In the mouth of Ramsey Canyon at the lower edge of the juniper belt, Donald Newman showed us the spot on which he had killed a porcupine in May, 1949. Another was killed near here by him and Roy Newman about 1944. Earl Long who knows the Mountains well says there are some porcupines present. Other reports were heard but we could not judge their reliability. One included the trapping by Leo Phillips many years ago of a female porcupine from beneath the Baumkirshner cabin at the head of Miller Canyon. Other reports were of the infrequent occurrence of porcupines near the very ridge or crest of the Mountains. One sizeable scar, observed in 1950, 18 feet up in a yellow pine on the Carr Canyon Reef at about 7500 feet altitude may have represented porcupine "work." We neither saw nor collected any porcupines.

Lepus californicus eremicus Allen

BLACK-TAILED JACK RABBIT

Lepus texianus eremicus Allen, Bull. Amer. Mus. Nat. Hist., 6:347,
1894. Fairbank, Cochise Co., Arizona.

Lepus californicus eremicus, Nelson, No. Amer. Fauna, 29:140, 1909.

Records of occurrence.—Mouth of Ramsey Canyon, 1 (skull only); 8 mi. W Fort, 1; 8 mi. SE Fort, 1; "Huachuca Mts.," 1 (U.S. Nat. Mus., see Nelson, 1909:141).

Comparisons.—Four adult specimens, skins and skulls, from the eastern side of the Huachucas are available for study. These are from 5 mi. E Miller Canyon, 8 mi. SE Fort, and 8 mi. W Fort. The skins, all taken in August, show considerable variation in color. The dorsum and forehead of 1 is dark, 1 has these areas pale, and 2 have a buffy tinge. In all, the lower sides and upper legs are heavily tipped or washed with Pinkish Buff, and this may encroach onto the underparts.

With the exception of 1 specimen (from 8 mi. SE Fort), our specimens are pale as in *eremicus*, paler than in *L. c. californicus*, and more buffy than in *L. c. texianus*.

Measurements.—Three adult males (2 from 5 mi. E Miller Canyon, 1 from 8 mi. SE Fort) and 1 adult female (8 mi. W Fort) are, respectively: total length, 530, 508, 498, 570; tail, 79, 78, 66, 104; hind foot, 123, 125, 125, 140; ear from notch, 115, 135, —, 126; basilar length, 66.5, 70.4, 67.9, 69.1; greatest zygomatic breadth, 41.3, 40.9, 42.4, 40.9; postorbital constriction, 11.1, 13.2, 12.9, 12.7; length nasals, 35.3, 37.0, 37.1, 36.8; width nasals, 17.8, 17.5, 17.7, 17.9; alveolar length premolar-molar series, 15.7, 15.0, 15.7, 15.2; diameter auditory meatus, 5.0, 6.0, 5.0, 6.0; breadth braincase, 26.0, 27.4, 28.5, 28.6; length palatal bridge, 6.1, 7.0, 5.4, 6.1. Cranial measurements are made according to Orr (1940).

Remarks.—Black-tailed jack rabbits were common and abundant in 1950 on the lower parts of the alluvial fans and flats. "Jacks" were seen near the mouth of every canyon on the east side of the Mountains, and on the west side on the high, grassy plains all the way up to Montezuma Pass. They were most commonly noted from near sundown on through the night. On a one-eighth-mile stretch of road at the lower end of Miller Canyon we frequently saw 3 to 5 at dusk. In 1949 black-tailed jacks were less abundant, and sometimes in an evening's hunt not more than 2 or 3 were seen. Some residents thought that rabbits had increased in 1949 and 1950 and that this increase might be correlated with a decrease in coyotes, as a result of the intensive program of predatory animal control in this area.

It is fairly easy to "hold" a jack in the beam of a spotlight. We attempted to run one down along the road from Nicksville to Hereford. After the jack had run at least a mile in short spurts, but all of the time within the range of our spotlight, we still had to shoot it with .22 dust shot to slow it enough to catch it by hand.

Lepus gaillardi gaillardi Mearns**GAILLARD'S JACK RABBIT**

Lepus gaillardi Mearns, Proc. U.S. Nat. Mus., 18:560, 1896. West arm of Playas Valley, near monument no. 63, Grant Co., New Mexico.

Remarks.—On the high plain along the west side of the Huachucas, and opposite Lone Mountain, we saw in the spotlight of our car on August 16, 1950, a large jack rabbit without black tips on the ears. In our anxiety to obtain this "different" animal, we accidentally disconnected the spotlight and it escaped. The same evening we saw another rabbit which also seemed quite different than the many black-tailed jack rabbits at the south edge of D'Albini's Ranch, but it out-distanced us. We felt rather confident that these 2 specimens were *Lepus gaillardi* and we returned on 3 evenings to hunt carefully for these jacks. On these later trips all we obtained or saw were black-tailed jack rabbits.

It seems very probable that these animals were *Lepus gaillardi*, although we know of no records of this species in Arizona. The species has been taken less than 90 miles east in New Mexico. These rabbits would probably be of the subspecies *L. g. gaillardi*.

Sylvilagus audubonii arizonae (Allen)**DESERT COTTONTAIL**

[*Lepus sylvaticus*] var. *arizonae* J. A. Allen, Monogr. No. Amer. Rodentia, p. 332, 1877. Beals Spring, Yavapai Co., Arizona.

Sylvilagus auduboni arizonae, Nelson, No. Amer. Fauna, 29:222, 1909.

Records of occurrence.—Mouth of Miller Canyon, 5¹; Fort Huachuca, 3 (U.S. Nat. Mus., see Nelson, 1909:225). Other occurrences are mentioned under **Remarks**.

Comparisons.—The Huachuca Mountains are in a zone of intergradation between *S. a. arizonae* and *S. a. minor* (type locality, El Paso, Texas). Specimens from Miller Canyon average larger than either *arizonae* or *minor* in total length and length of hind foot and smaller in length of tail, but in all 3 features are nearest *arizonae*. The ear length is intermediate between these 2 subspecies. The skull averages larger than either, but in this respect is nearest *S. a. arizonae*. Three specimens are buffy grayish, typical of *arizonae*. Two are darker, but this is the result of worn and abraded pelage. Nelson (1909) regards specimens from the Huachucas and western Cochise County as *arizonae* and those from eastern Cochise County as *minor*. Our conclusions are similar.

Measurements.—Three adult males¹ and 1 adult female¹ are, respectively: total length, 390, 385, 315, 413; tail, 42, 40, 55, 49; hind foot, 94,

99, 97, 103; ear from notch (measurements, dry, in parentheses), 69 (66.2), 68(60.3), 74(66.2), 69(63.6); basilar length, 54.2, 55.8, 52.3, 55.9; greatest zygomatic breadth, 34.8, 36.2, 36.0, —; postorbital constriction, 12.2, 11.9, 12.3, 12.4; length nasal, 31.6, 31.0, 29.2, 31.4; width nasals, 14.7, 15.0, 14.1, 14.6; alveolar length premolars-molars, 13.6, 13.0, 12.6, 13.5; diameter auditory meatus, 4.7, 4.4, 5.1, 4.6; breadth braincase, 25.7, 26.1, 26.5, 27.1; length palatal bridge, 7.2, 5.9, 5.4, 7.6.

Remarks.—The desert or Audubon cottontail was found principally in the oak belt and frequently where the oaks were adjacent to the mouths of the canyons. It was not common to see these cottontails far out on the open alluvial fans or up in the pine belt. Specimens were noted in Carr Canyon to above 6000 feet elevation, but still in the oak belt. Whereas jack rabbits are crepuscular and nocturnal, these cottontails were principally diurnal. In an early morning's drive up Miller Canyon in August, 1949, at least 4 or 5 cottontails would be seen.

Sylvilagus audubonii must occur throughout the Mountains on the lower slopes. We have seen them on the west side near Sunnyside, to the south near Montezuma Pass, to the north around the Fort, and at several places along the eastern base.

The only female we took had 4 embryos on August 5.

Sylvilagus floridanus holzneri (Mearns)

EASTERN COTTONTAIL

Lepus sylvaticus holzneri Mearns, Proc. U.S. Nat. Mus., 18:554, 1896. Douglas fir zone, near summit Huachuca Mts., Cochise Co., Arizona.

Sylvilagus floridanus holzneri, Lyon, Smithsonian Misc. Coll., 45: 336, 1904.

Records of occurrence.—“Huachuca Mts.,” 16(13, U.S. Nat. Mus., see Nelson, 1909:180; 3, Chicago Nat. Hist. Mus.). None of these specimens has been examined by us.

Remarks.—*Sylvilagus floridanus* must live only near the crest of the Huachuca Mountains and probably above 8000 feet. We had a brief glimpse of what we took to be an *S. floridanus* at the head of Miller Canyon near 8500 feet. This specimen was in a heavy pine forest, and the ground cover was relatively sparse. Some of the shallow drainage channels on the Mountains had small thickets of brush about 2½-feet high. The only cottontail we saw ran from one of these to another and escaped us. We were unsuccessful in collecting any, although we looked for them especially. *S. floridanus* is much more secretive than *S. audubonii* in the Huachucas.

Those persons inhabiting the Mountains who make trips to the crest were aware of the fact that there was a rabbit there, a “high mountain

“rabbit” as they called it, different from the cottontails on the flats and alluvial fans. They regarded the high mountain form as the larger and more difficult to find. The sparseness of the cover where this rabbit lives in the pines and firs may account for its secretive nature.

Pecari tajacu sonoriensis (Mearns)

COLLARED PECCARY, JAVELINA

Dicotyles angulatus sonoriensis Mearns, Proc. U.S. Nat. Mus., 20:3 (reprint, p. 469), 1897. San Bernardino River, near Boundary Monument no. 77, Sonora, Mexico.

Tayassu angulatum sonoriense, Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30:12, 1901.

Pecari angulatus sonoriensis, Miller, Bull. U.S. Nat. Mus., 79:383, 1912.

Records of occurrence.—Blacktail Canyon, about 5500 ft., 1¹ (skull only); Garden Canyon, 5500 ft., 2² (skulls only); see *Remarks*.

Comparisons.—In the absence of comparative material, we have referred the material from the Huachucas to *P. t. sonoriensis*. The type locality of this subspecies is only 65 miles away from the Fort. The skull from Blacktail Canyon is that of an aged individual with the roots on the teeth short; some teeth have been lost, apparently due to extreme wear, and their alveoli have closed over. This is true for 5 lower incisors and 1 upper incisor. One skull from Garden Canyon is of an equally old animal, and there is evidence of considerable dental caries: the first 2 right upper premolars have the roots exposed as does left M²; left M³ has been lost; lower right M₁ is badly decayed. Dental caries may be common in adult peccaries in this region.

Measurements.—Two aged adult skulls^{1, 2}, teeth worn smooth, unsexed: greatest length, 241, 236; condylobasal length, 203, 202; basilar length of Hensel, 183, 181; least interorbital constriction, 52.0, 51.7; greatest zygomatic breadth, across glenoid fossae, 109, 99; breadth across postorbital processes (tip to tip), 79.3, 73.6; alveolar length of maxillary toothrow, 90.9, 88.7; alveolar length of upper premolar-molar series, 58.0, 61.7; alveolar length of lower premolar-molar series, 66.4, 69.0.

Remarks.—Collared peccaries, or javelinas, have been present in the Huachucas as long as the oldest residents can remember. Mearns (1907: 166), writing of 1892-93, speaks of “the former presence of peccaries in the Huachuca Mountains,” and indicates that “soldiers under the command of Capt. Louis A. Craig killed some of them a few years before.” In 1918 Stanley Young caught a peccary in a “wolf” trap near Sunnyside. Since peccaries usually travel in bands, being numerous in one place and absent in many other places, they may not have been encountered by Mearns when he was in the Huachucas. Because the animals are rather

secretive, many residents in the Mountains see them only rarely. Actually peccaries occur throughout the Mountains but rarely extend above the oak forest. Peccaries use certain caves and mine tunnels in which to congregate and bring forth young. One such tunnel in Bear Canyon was used by peccaries, as indicated by a good amount of droppings. We were told there were other mine tunnels so occupied. Miners and prospectors consider the peccary beneficial, since it kills and eats rattlesnakes and other snakes in the mine tunnels. Alex D'Albini said that javelinas occasionally came into his orchard to feed on the fruit that had fallen to the ground. In Sycamore Canyon, to the northwest of Fort Huachuca, there is a dense stand of sacaton and, according to Wallmo (1951), javelinas have a particular liking for this habitat.

Immature peccaries were seen in Miller Canyon in August, 1949. Skulls were found in Garden and Blacktail canyons. Mrs. Vinita Bledsoe told us of seeing one run across the road near the mouth of Hunter Canyon. Charles Wallmo reported seeing peccaries as follows: 4 at Sylvania, 4 at the head of Blacktail Canyon, 3 at the mouth of Blacktail Canyon, 6 in Bear Canyon, 4 in Sycamore Canyon, 1 below Lone Mountain, 3 in Garden Canyon, and 2 in Huachuca Canyon.

***Odocoileus hemionus crooki* (Mearns)**

MULE DEER

Dorcelaphus crooki Mearns, Proc. U.S. Nat. Mus., advance sheets, p. 2, 1897. Summit, Dog Mountains, Grant Co., New Mexico.

Odocoileus crooki, Thompson, Forest and Stream, 51:286, 1898.

Odocoileus hemionus canus Merriam, Proc. Wash. Acad. Sci., 3:560, 1901. Sierra en Media, Chihuahua, Mexico.

Odocoileus hemionus crooki, Goldman and Kellogg, Jour. Mamm., 20: 507, 1939.

Records of occurrence.—See *Remarks*.

Remarks.—Mule deer or black-tailed deer occur principally on the flats away from the Mountains. Their tracks are fairly abundant in the washes and draws that extend up from the San Pedro River. However, a few mule deer do get into the Mountains, particularly at the north end. One place where they enter the Mountains is Blacktail Canyon, according to Earl Long. Price says of the black-tailed deer (Allen, 1895:257), "Some few bands still live along the west slope of the Huachuca Mountains. At a ranch house we saw some very fine antlers which had been taken during the fall of 1893."

Odocoileus virginianus couesi* (Coues and Yarrow)*WHITE-TAILED DEER**

Cariacus virginianus var. *couesi* Coues and Yarrow, Rept. Geogr. Geol. Expl. and Surv. West of 100th Meridian, 5:72, 1875.
Camp Crittenden, Pima Co., Arizona.

Odocoileus couesi, Thompson, Forest and Stream, 51:286, 1896.

Odocoileus virginianus couesi, Lydekker, Cat. Ung. Mamm. British Mus., 4:158, 1915.

Records of occurrence.—Garden Canyon, 3¹; government cabin, head Garden Canyon, 1²; Sawmill Canyon, 1³; upper Huachuca Canyon, 1⁴; Coyote Canyon, 1⁵; head Carr Canyon, 1⁶(all skulls only).

Comparisons.—Whitetails in the Huachucas are typical, small *O. v. couesi*. Fort Huachuca is within 20 miles of the type locality of this sub-species. We heard several reports of an even smaller deer inhabiting these Mountains. These may be very thin *O. v. couesi*. We know of no collected specimens of these small "rock deer," as they are locally called. It is upon Dr. Remington Kellogg's advice that we have regarded *couesi* as a sub-species of *Odocoileus virginianus*.

Measurements.—External measurements are not available for specimens from the Huachucas, but Mr. Steve Gallizioli has made available the measurements of 10 males: 6 from the Chiricahua Mountains and 4 from Cerro Colorados, Pima County (measured by Wendell Swank). The males from the Chiricahuas are bucks with 2 or 3 points on each beam, in addition to a brow tine. The number of points is not available for those from the Cerro Colorados, but they must be of comparable age, judging from the measurements. Total length, 1426.0(1283–1641); tail, 169.1(133–187); hind foot, 379.6(340–410); ear from notch, 162.4(155–170); ear from crown (on 4 only), 170.5(162–178); height at shoulders, 790.3(724–870); metatarsal gland (for 2), 17.5, 16.1; weight in pounds (for 5), 79(55–96).

Cranial measurements of skulls, picked up in the Huachucas, for ♂¹, very old, teeth worn nearly to alveoli, practically no pattern; ♂¹, same as previous; ♂⁵, teeth moderately worn; ♀³, old, teeth much worn but some pattern remaining; ♀⁴, same as previous; ♀⁶, very old, wear as in 1st male; ♀¹, very old, wear as in 1st male, are respectively: basilar length, ♂, 219, 224, —, ♀, 200, 201, —, —; length nasal, 60.3, 67.2, 70.4, 57.8, 60.1, —, 60.5; greatest width nasals, at posterior margin nasal-maxilla suture, 22.9, 35.7, —, 24.3, 24.0, —, 20.0; orbital width, 60.7, 63.8, 61.5, 54.4, 54.8, 55.8, 55.8; zygomatic width, 102.6, 109.7, 103.0, 90.6, 95.2, 94.7, 97.5; mastoidal width, 74.8, 84.0, 83.7, 67.5, 71.2, 71.5, 69.8; upper molar series, 66.1, 65.1, 66.1, 63.2, 67.2, 66.2, 64.0; palatal breadth, 44.9, 44.9, 41.9, 36.9, 39.8, 39.4, 40.7; diameter antler beam

$\frac{1}{2}$ inch above burr, males only, 25.4, 31.5, 31.4. Measurements that are not explained are made according to Cowan (1936).

Remarks.—Coues deer or Coues whitetail is one of the smallest varieties of white-tailed deer, *Odocoileus virginianus*. Large, mature bucks weigh less than 100 pounds and does less than 65 pounds. Adult bucks average only 31 inches high at the shoulder.

These deer occur from the brushy alluvial fans to the crest of the Huachucas. They were probably most common in the oaks in August, and numbers of them could be seen in this zone any night. In the pines and fir at the head of Miller Canyon, about 8200 feet elevation, 3 deer browsed in mid-morning within 50 yards of us while we remained quiet in the shade of a cabin. We rarely saw deer during the daytime in the oak belt, and they would never approach close to us; they most likely were more wary at this low elevation where there is a greater likelihood of encountering human beings.

Whitetails are abundant in the Huachucas. Wallmo (1951) and a technician made 702 observations of white-tailed deer in the fiscal year (July 1 to June 30) 1950-1951, and 263 in 1949-1950. A walking survey of 129 miles revealed 109 deer. Wallmo's work in 1949-1950 indicated approximately 2 does for each buck and a fawn crop of over 70 per cent of the females. This would indicate a good increase annually, but depredation by mountain lions and hunting by man have kept down any sizeable increase. Man's checking effect has not been too great, since the average kill of deer in the Huachucas over 4 years (1946-1948, 1950) was 76 per year (Wallmo, 1951). Mountain lions must play an important part in preventing an over-abundance of deer in the Mountains, but elimination of lions in these Mountains might be unwise, from the cattleman's viewpoint. Deer might then increase much more rapidly and compete for the browse which the cattle use when they run in the Mountains. At the present time the density of deer in the Mountains has not resulted in over-browsing, Wallmo (1951) points out, for there is a good supply of suitable forage throughout the Huachucas.

Whitetails are also preyed upon in the Huachucas by coyotes, wolves, and eagles. While in Cave Creek Canyon we found that a soaring eagle caused a deer on the opposite slope to give a sharp "cry."

In August we saw numerous fawns varying in age from about one to several weeks. Wallmo (1951) found that in the Huachucas fawns were dropped in July, the rut was from December through February, old antlers were shed in very late spring, and new antlers appeared in July.

Antilocapra americana (cf. *mexicana* Merriam)**PRONGHORN**

Antilocapra americana mexicana Merriam, Proc. Biol. Soc. Wash., 14:31, 1901. Sierra en Media, Chihuahua, Mexico.

Records of occurrence.—“Several bands . . . along the bases of the Huachuca . . . Mountains” (in 1894), see Price (in Allen, 1895:257). Native stock now exterminated; re-introduced at Fort Huachuca.

Comparisons.—Pronghorns from the Huachucas may have been referable to either *A. a. mexicana* (Sierra en Media, Chihuahua) or *A. a. sonoriensis* Goldman (1945:3, 40 mi. N Costa Rica, Sonora). Goldman includes within the range of *sonoriensis* “southern Arizona,” and considers a specimen from Fort Buchanan (=Crittenden), Santa Cruz County, Arizona, as sharing some of the characters of the type of *sonoriensis* (Goldman, 1945:4). Crittenden is only 20 miles from Fort Huachuca. Goldman goes on to say, “On geographic grounds, however, specimens from southeastern Arizona may be expected to exhibit gradation toward *mexicana*.” Since there are no native specimens from the Huachucas available for comparison with either *mexicana* or *sonoriensis*, we cannot be sure of the subspecific identity of the original stock. We are naturally dubious of the validity of *A. a. sonoriensis* since Goldman had only 2 specimens (and 1 of these the skull only from Fort Buchanan) with which to measure individual variation and evaluate diagnostic characteristics.

Remarks.—Price saw small bands (of 12 or fewer individuals) at the base of the Huachucas in 1894. Mearns apparently saw none in October, 1892, or July, 1893. Mearns mentions them from San Pedro Valley, from near Tombstone, and from the foothills near Dragoon Summit (Mearns, 1907:229-230). A. K. Fisher (1892) writes that in 1892 “no antilopes [sic] were seen, but small bands occur on the plain between the Post and the mouth of Garden Cañon every winter.” Stanley Young told us he saw pronghorns on the flats to the north of the Huachucas as late as 1916-1919.

In December, 1949, 72 pronghorns were moved into and released in an enclosure at Fort Huachuca. In January, 1951, 18 more antelope were released. Of the 90 released, many died and many more escaped from the enclosure and moved into the Mountains. Whether these escapees will ever establish themselves as a wild stock in and around the Huachucas remains to be seen. They have not up to this time. In June, 1953, 68 pronghorns were still in the enclosure.

Hypothetical List

Tadarida mexicana (Saussure). *Mexican Free-tailed Bat*. This species most likely occurs at times in the buildings at the Fort, and perhaps elsewhere at the base of the Mountains. For further comments, see *Tadarida femorosacca* (page 69).

Mustela frenata neomexicana (Barber and Cockerell). *Long-tailed Weasel*. Numerous inquiries produced no information as to the presence of weasels in the Mountains in 1950, but Price (in Allen, 1895:255-256) in writing of his collecting says, "A weasel was taken at 9000 feet elevation in the Huachuca Mountains during 1893, and from casual observation I supposed it to be *P. brasiliensis frenatus*." One would suspect that weasels certainly were not present in the Huachucas because the pocket gophers high on the side of Carr Peak frequently plugged their burrow entrances only with sunflower leaves, not with dirt. Weasels are natural enemies of these gophers.

Felis pardalis sonoriensis Goldman. *Ocelot*. Goldman (1943:378) gives the range of this subspecies of ocelot as north to southeastern Arizona and formerly as far north as Fort Verde, Arizona. If this cat did occur in southeastern Arizona, the Huachucas would be a likely place. No reports of such a cat were heard by us from any of the inhabitants to whom we talked.

Tamiasciurus fremonti (cf. *grahamensis* Allen). *Chickaree*. It is questionable that the spruce squirrel or chickaree was ever present in the Huachuca Mountains, but if so, apparently it is now extinct there. Mearns (1907:262) writes as follows: "Lieut. Harry C. Benson, writing from Fort Huachuca, Arizona, September 26, 1884, speaks of 'squirrels—gray and red (one specimen only seen).' I subsequently heard of a red-backed squirrel that had been shot and skinned in the Huachuca Mountains, about 1893, which I thought possibly *S. aberti*. Both this and Lieutenant Benson's 'red' squirrel may have been a form of this chickaree."

Ovis canadensis mexicana Merriam. *Bighorn*. These sheep were reported to occur in the Santa Ritas (Mearns, 1907:239), possibly in the Chiricahuas (Price, in Allen, 1895:258), and were seen in the Santa Catalinas as late as 1894 (Price, *loc. cit.*). It seems possible that they may have occurred, at least occasionally, in parts of the Huachucas, particularly in some of the rimrock and at the southern end below Montezuma Pass.

Mammals Adjacent to But Not in Huachuca Mountains

As pointed out before, this report is restricted to the mountainous portion of the Huachucas, including the alluvial fans of the canyons and the bajada connecting these fans around the base of the mountains. It is not always easy to draw a sharp limit between the bajada and the desert. Therefore, some mammals known to occur below the area studied, that is, farther out in the desert floor, are included in this list for completeness. Perhaps we should have placed *Antrozous pallidus pallidus* in this list, for this species has not been taken in the "Mountains." However, it has been taken close to them, and since these bats are good flyers, we feel confident they do occasionally get to the base of the Mountains.

Citellus harrisii harrisii (Audubon and Bachman). *Yuma Antelope Ground Squirrel*. These ground squirrels occur on the open desert, well below the bajada and alluvial fans. The squirrels can be seen along roads between the Mountains and the San Pedro River.

Castor canadensis frondator Mearns. *Beaver*. Beaver formerly were present along the San Pedro Valley, probably within 8 miles of the base of the Huachucas, and on Babocomari Creek.

Lepus alleni alleni Mearns. *Antelope Jack Rabbit*. This jack occurred in good numbers in the Babocomari tract to the north of Fort Huachuca among mesquites and a lush growth of grasses and weeds. They were in association with *Lepus californicus*. According to Earl Long, this area of about 2 miles square is the only spot near the Huachucas where antelope jack rabbits occur. Other places within the area of the Huachucas looked the same, but no antelope jacks were there. One female taken 7 miles north of the Fort contained nearly full-term embryos on August 23. Four of these embryos were removed from the amniotic sac and kept alive from 3 to 5 days. They were completely furred, their eyes were open, and they were able to move about. These 4 give the following measurements in millimeters: total length, 161, 169, 154, 164; tail, 19, 20, 16, 17; hind foot, 40, 43, 41, 41; ear from notch, 31, 33, 31, 33.

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Literature Cited

Allen, G. M.

1916. Bats of the genus *Corynorhinus*. Bull. Mus. Comp. Zool., 60 (9):331-356.

Allen, J. A.

1894. Descriptions of five new North American mammals. Bull. Amer. Mus. Nat. Hist., 6:347-350.

1895. On a collection of mammals from Arizona and Mexico, made by Mr. W. W. Price, with field notes by the collector. *Ibid.*, 7:193-258.

Benson, S. B.

1934. Description of a race of *Dipodomys merriami* from Arizona. Proc. Biol. Soc. Wash., 47:181-184.

1935. A protective habit of *Dipodomys deserti*. Jour. Mamm., 16:67-68.

1939. Descriptions and records of harvest mice (genus *Reithrodontomys*) from Mexico. Proc. Biol. Soc. Wash., 52:147-150.

1940. A new cotton rat (*Sigmodon*) from Arizona and New Mexico. *Ibid.*, 53:157-158.

Blossom, P. M., and W. H. Burt

1942. A new race of pygmy mouse (*Baiomys*) from Arizona. Univ. Mich. Mus. Zool., Occas. Paper 465:4 pp.

Borell, A., and M. D. Bryant

1942. Mammals of the Big Bend area of Texas. Univ. Calif. Publ. Zool., 48:62 pp.

Burt, W. H.

1933. Additional notes on the mammals of southern Arizona. Jour. Mamm., 14:113-122.

1938. Faunal relationships and geographic distribution of mammals in Sonora, Mexico. Univ. Mich. Mus. Zool., Misc. Publ. 39:77 pp.

Campbell, B.

1934. Notes on bats collected in Arizona during the summer of 1933. Jour. Mamm., 15:241-242.

Cowan, I. M.

1936. Distribution and variation in deer (genus *Odocoileus*) of the Pacific coastal region of North America. Calif. Fish and Game, 22:157-245.

Crabb, W. D.

1944. Growth, development and seasonal weights of spotted skunks. Jour. Mamm., 25:213-221.

Darrow, R. A.

1944. Arizona range resources and their utilization. I. Cochise County. Univ. Ariz. Agric. Exp. Sta., Tech. Bull. 103:311-366.

Dice, L. R., and P. M. Blossom

1937. Studies of mammalian ecology in southwestern North America with special attention to the colors of desert mammals. Carnegie Inst. Wash., 485:iv+129 pp.

Dixon, J.

- 1924. Notes on the life history of the gray shrew. *Jour. Mamm.*, 5:1-6.

Doutt, J. K.

- 1931. A new subspecies of the Arizona gray squirrel (*Sciurus arizonensis* Coues). *Ann. Carnegie Mus.*, 20:271-273.

Fisher, A. K.

- 1892. A list of the mammals observed in southeastern Arizona in the Huachuca Mountains and vicinity, April 26 to June 11, 1892. *MS, U.S. Fish and Wildlife Service, Biol. Surv.*, 11 unnumbered pages.

Fisher, H. I.

- 1941. Notes on shrews of the genus *Notiosorex*. *Jour. Mamm.*, 22: 263-269.

Gazin, C. L.

- 1942. The late Cenozoic vertebrate faunas from the San Pedro Valley, Ariz. *Proc. U.S. Nat. Mus.*, 92:475-518.

Gidley, J. W.

- 1923. Preliminary report on fossil vertebrates of the San Pedro Valley, Arizona, with descriptions of new species of Rodentia and Lagomorpha. *U.S. Geol. Surv., Prof. Paper 131-E*:119-131, pl. 34, 35.

Glass, B. P.

- 1947. Geographic variation in *Perognathus hispidus*. *Jour. Mamm.*, 28:174-179.

Goldman, E. A.

- 1910. Revision of the wood rats of the genus *Neotoma*. *No. Amer. Fauna*, 31:124 pp.
- 1922. Two new skunks of the genus *Conepatus*. *Jour. Mamm.*, 3:40-41.
- 1933. New mammals from Arizona, New Mexico, and Colorado. *Jour. Wash. Acad. Sci.*, 23:463-473.
- 1939. A new badger from Sonora. *Ibid.*, 29:300-301.
- 1943. The races of the ocelot and margay in Middle America. *Jour. Mamm.*, 24:372-385.
- 1945. A new pronghorn antelope from Sonora. *Proc. Biol. Soc. Wash.*, 58:3-4.
- 1947. The pocket gophers (genus *Thomomys*) of Arizona. *No. Amer. Fauna*, 59:39 pp.
- 1950. Raccoons of North and Middle America. *Ibid.*, 60:vi+153 pp.

Hall, E. R.

- 1946. Mammals of Nevada. Berkeley and Los Angeles: Univ. Calif. Press, 1946, 710 pp.
- 1951. American weasels. *Univ. Kansas Publ., Mus. Nat. Hist.*, 4:1-466.

Hatfield, D. M.

- 1936. A revision of the *Pipistrellus hesperus* group of bats. *Jour. Mamm.*, 17:257-262.

Hershkovitz, P.

- 1951. Mammals from British Honduras, Mexico, Jamaica and Haiti. *Fieldiana - Zoology*, 31:547-569.

Hibbard, C. W.

- 1939. Notes on additional fauna of Edson quarry of the Middle Pliocene of Kansas. *Trans. Kansas Acad. Sci.*, 42:457-462.

Hock, R. J.
1952. The opossum in Arizona. *Jour. Mamm.*, 33:464-470.

Hollister, N.
1914. A systematic account of the grasshopper mice. *Proc. U.S. Nat. Mus.*, 47:427-489.
1916. A systematic account of the prairie dogs. *No. Amer. Fauna*, 40: 37 pp.

Hooper, E. T.
1952. A systematic review of the harvest mice (genus *Reithrodontomys*) of Latin America. *Univ. Mich. Mus. Zool., Misc. Publ.* 77: 255 pp.

Howell, A. H.
1901. Revision of the skunks of the genus Chincha. *No. Amer. Fauna*, 20:62 pp.
1906. Revision of the skunks of the genus Spilogale. *Ibid.*, 26:55 pp.
1914. Revision of the American harvest mice (Genus *Reithrodontomys*). *Ibid.*, 36:97 pp.
1938. Revision of the North American ground squirrels, with a classification of the North American Sciuridae. *Ibid.*, 56:256 pp.

Jackson, H. H. T.
1928. A taxonomic review of the American long-tailed shrews. *No. Amer. Fauna*, 51:238 pp.

Little, E. L., Jr.
1938. A record of the jaguarundi in Arizona. *Jour. Mamm.*, 19:500-501.

Mearns, E. A.
1907. Mammals of the Mexican boundary of the United States . . . Part I. *Bull. U.S. Nat. Mus.*, 56:xv+530 pp.

Merriam, C. H.
1898. Life zones and crop zones of the United States. *U.S. Dept. Agric., Biol. Surv. Bull.*, 10:79 pp.

Miller, G. S., Jr.
1897. Revision of the North American bats of the family Vespertilionidae. *No. Amer. Fauna*, 13:141 pp.

Miller, G. S., Jr., and G. M. Allen
1928. The American bats of the genera *Myotis* and *Pizonyx*. *Bull. U.S. Nat. Mus.*, 144:viii+218 pp.

Nelson, E. W.
1909. The rabbits of North America. *No. Amer. Fauna*, 29:314 pp.

Nelson, E. W., and E. A. Goldman
1933. Revision of the jaguars. *Jour. Mamm.*, 14:221-240.

Orr, R. T.
1940. The rabbits of California. *Occas. Papers Calif. Acad. Sci.*, 19: 207 pp.

Osgood, W. H.
1900. Revision of the pocket mice of the genus *Perognathus*. *No. Amer. Fauna*, 18:73 pp.
1909. Revision of the mice of the American genus *Peromyscus*. *Ibid.*, 28:285 pp.

Ridgway, R.
1912. Color standards and color nomenclature. Washington, D.C., privately printed, iv+44 pp., 53 pls.

Schantz, V. S.
1948. A new badger from Mexico—United States boundary. Proc. Biol. Soc. Wash., 61:175-176.

Setzer, H. W.
1949. Subspeciation in the kangaroo rat, *Dipodomys ordii*. Univ. Kansas Publ., Mus. Nat. Hist., 1:473-573.

Shamel, H. H.
1931. Notes on the American bats of the genus *Tadarida*. Proc. U.S. Nat. Mus., 78:1-27.

Swarth, H. S.
1929. The faunal areas of southern Arizona; a study in animal distribution. Proc. Calif. Acad. Sci., 18:267-383.

Vorhies, C. T., and W. P. Taylor
1922. Life history of the kangaroo rat, *Dipodomys spectabilis spectabilis* Merriam. U.S. Dept. Agric., Bull. 1091, 40 pp.

Wallmo, O. C.
1951. Fort Huachuca wildlife area surveys 1950-1951. Ariz. Game and Fish Comm. Wild. Rest. Div., 1951, various parts paged separately, 76 pp.
MS. Vegetation of the Huachuca Mountains, Arizona.

Young, S. P., and E. A. Goldman
1944. The wolves of North America. American Wildlife Inst., Washington, D.C., 1944, xx+636 pp.
1946. The puma, mysterious American cat. American Wildlife Inst., Washington, D.C., 1946, xiv+358 pp.

Young, S. P., and A. F. Halloran
1952. Arizona specimens of the black-footed ferret. Jour. Mamm., 33: 251.



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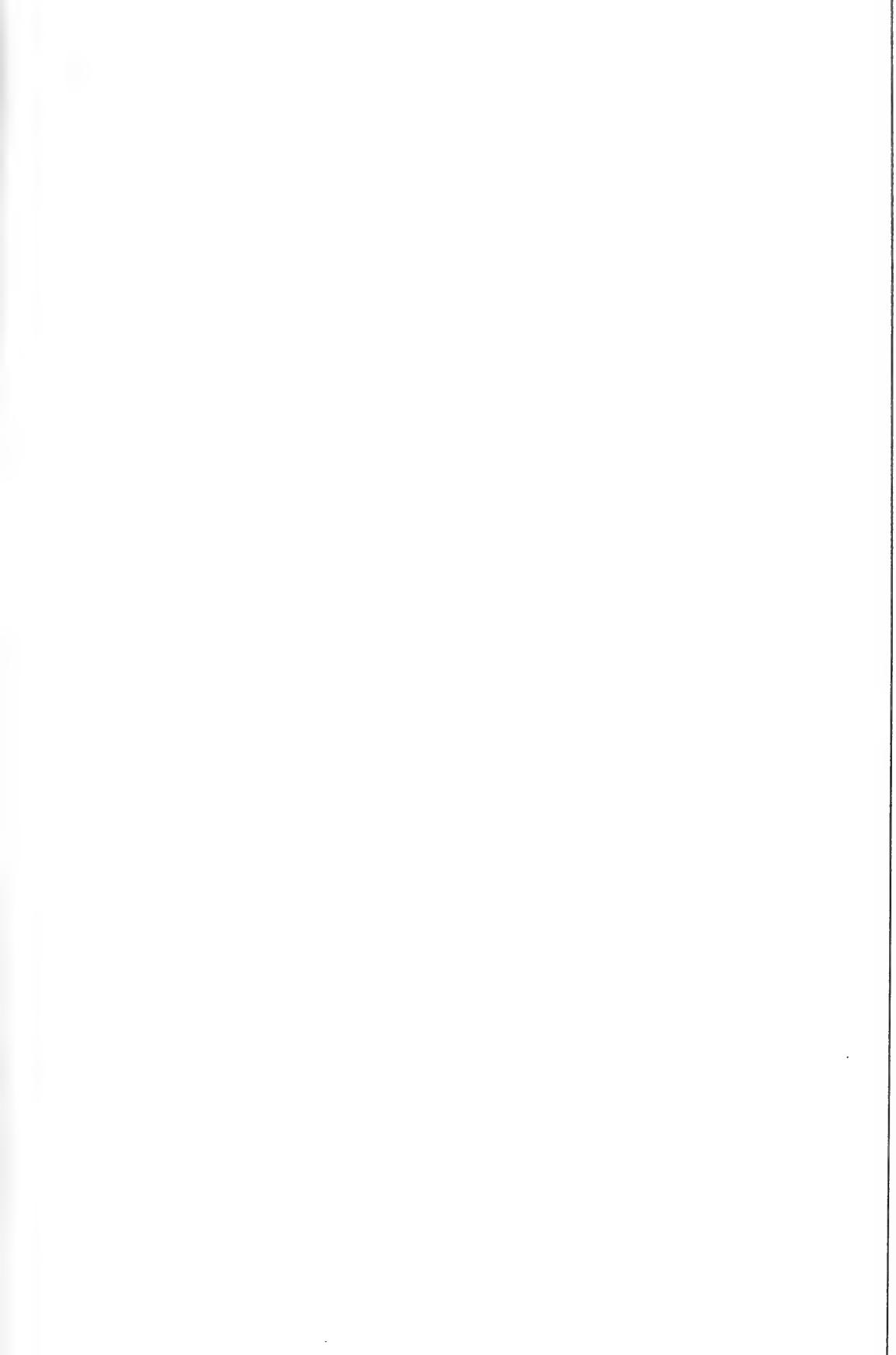
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